ONGOING PROBLEMS AND FUTURE PLANS FOR NOAA'S WEATHER SATELLITES

HEARING

BEFORE THE

COMMITTEE ON SCIENCE
HOUSE OF REPRESENTATIVES

ONE HUNDRED NINTH CONGRESS

FIRST SESSION

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ONGOING PROBLEMS AND FUTURE PLANS FOR NOAA'S WEATHER SATELLITES

WEDNESDAY, NOVEMBER 16, 2005

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE,
Washington, DC.

The Committee met, pursuant to call, at 10:09 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Sherwood L. Boehlert [Chairman of the Committee] presiding.

COMMITTEE ON SCIENCE
U.S. HOUSE OF REPRESENTATIVES

Ongoing Problems and Future Plans for NOAA Weather Satellites

Wednesday November 16, 2005

10:00 AM – 12:00 PM
2318 Rayburn House Office Building (WEBCAST)

Witness List

Vice Admiral Conrad C. Lautenbacher, Jr. (Ret.)
Administrator
National Oceanic and Atmospheric Administration

Dr. Ronald M. Sega
Under Secretary for the Air Force

Dr. Alexis Livanos
President
Northrop Grumman Space Technology

Mr. David Powner
Director of Information Technology Management Issues
Government Accountability Office

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HEARING CHARTER

COMMITTEE ON SCIENCE
U.S. HOUSE OF REPRESENTATIVES

Ongoing Problems and Future Plans for NOAA's Weather Satellites

WEDNESDAY, NOVEMBER 16, 2005
10:00 A.M.—12:00 P.M.
2318 RAYBURN HOUSE OFFICE BUILDING

Purpose

On November 16, 2005 at 10:00 a.m., the House Science Committee will hold a hearing about ongoing problems and future plans for the National Oceanic and Atmospheric Administration's (NOAA) key weather satellite program, the National Polar-orbiting Operational Environmental Satellite System program (NPOESS).

NPOESS is designed to provide critical weather information for NOAA and the Air Force, which are jointly managing the program. (The National Aeronautics and Space Administration (NASA), which provides technical assistance is also involved in program management, and other military services besides the Air Force will also use the data from NPOESS.) NPOESS will replace current NOAA and Air Force satellites, which are nearing the end of their useful lives. NPOESS is the most expensive and perhaps the most complex satellite procurement in NOAA's history.

The NPOESS program has been deeply troubled and is now running as much as $3 billion over budget and as many as three years behind schedule, creating a possible gap in satellite coverage (if existing satellites fail before NPOESS can replace them). NOAA and the Air Force recently replaced the lead program manager, and some of the contractors have also brought in new people to oversee the program. NOAA and the Air Force will soon decide how they are going to bring the program under control. The agencies do not seem to be considering any options that would require additional funding before Fiscal Year (FY) 2008, but waiting to spend more funds is likely to increase total program costs and delays.

The hearing is intended to review how the program went awry, why Congress was not given more timely and accurate information on the status of the program, and, most importantly, how the program should move forward.

The Committee plans to examine these overarching questions:

1. What is the current estimate of the cost and launch date for the first NPOESS satellite compared to the September 2003 baseline ($7.4 billion and November 2009) and when will an official new baseline be available?
2. What program options are being considered in response to the increased cost and schedule delays?
3. It is our understanding that no options are being considered that increase spending in Fiscal Year (FY) 2006 or FY 2007. Why is that the case? Will delaying action until FY 2008 increase the lifetime cost of the NPOESS program and increase the risk that the satellite will not be ready in time to perform its mission?
4. If the last satellite from the current NOAA polar series fails during launch or in orbit, then, given the schedule delays anticipated for NPOESS, there could be a 19- to 36-month gap in polar satellite coverage for NOAA. If a coverage gap were to occur, what are the implications for NOAA and DOD weather forecasting capabilities? What are the Federal Government's contingency plans for a gap in polar satellite coverage?

Witnesses:

Vice Admiral Conrad C. Lautenbacher, Jr. (Ret.), Administrator of the National Oceanic and Atmospheric Administration.

Dr. Ronald M. Sega, Under Secretary of the Air Force.

Dr. Alexis Livanos, President of Northrop Grumman Space Technology.

Mr. David Powner, Director of Information Technology Management Issues, Government Accountability Office.

Background:

NPOESS: A new approach to weather satellite development

The Federal Government has traditionally launched separate weather satellites to serve military and civilian needs. The National Polar-orbiting Operational Environmental Satellite System (NPOESS), begun in 1994, is the first joint weather satellite program. The National Oceanic and Atmospheric Administration (NOAA) and the Department of Defense (DOD) together share the cost of developing the NPOESS satellites. The National Aeronautics and Space Administration (NASA) also supports the program primarily by overseeing the development of a small satellite, known as the NPP (for NPOESS Preparatory Project) designed to test some of the advanced sensors the NPOESS satellites will later carry, reducing the risk that these sensors will not work as expected.

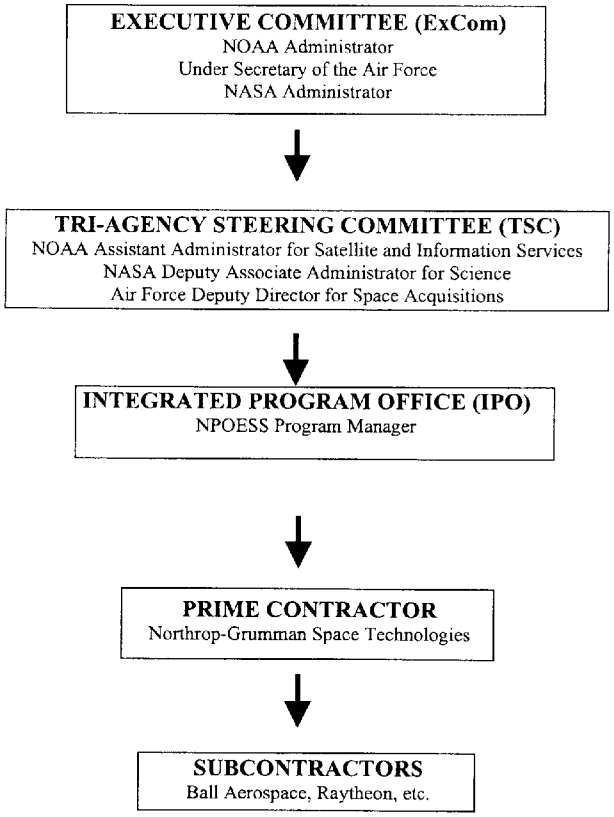
The NPOESS satellites are designed to fly in an orbit around the Earth's poles. They complement other weather satellites that orbit the Earth at the equator (so-called geostationary satellites because they orbit at the same speed as the Earth rotates, and so appear to hover above a fixed position on the ground). As polar-orbiting satellites circle the Earth, they provide global coverage of weather and climate conditions.

NPOESS satellites are being built to carry instruments, or sensors, to measure a number of meteorological features important to developing three- to seven-day weather forecasts and for predicting severe weather, such as hurricanes. For example, some sensors are being developed to measure ocean winds to help predict El Niño and aid the military's operation of aircraft carriers. Others will measure soil moisture, which is important to agriculture and water resource managers. Aerosol detectors will help predict such aviation hazards as volcanic ash while helping the military predict whether it will be able to accurately spot its targets. Ocean-color sensors can track fish populations and ocean-borne pollution while helping the military sweep for mines. And as the events of the last few months have shown, improved accurate forecasts can help better predict hurricane paths, allowing emergency managers to target their efforts and preventing unnecessary coastal evacuations that can cost up to $1 million a mile. (For list of the 13 instruments to be carried on board NPOESS satellites see Appendix 1.)

The NPOESS program is supposed to produce six weather satellites, only three of which will be placed in orbit at any one time. The satellites will replace polar-orbiting weather satellites now being flown by the military (known as the Defense Meteorological Satellite Program, or DMSP satellites) and by NOAA (known as Polar Operational Environmental Satellites, or POES). The six satellites, referred to as C–1 through C–6, are being developed by Northrop-Grumman Space Technology under a contract managed jointly by DOD and NOAA through an office called the Integrated Program Office (IPO). (For an organizational chart showing the management structure of the NPOESS program, see Figure 1.)

The NPP test satellite is being developed by Ball Aerospace and Technologies Corporation under a contract managed by NASA rather than by the IPO. NPP will allow weather and climate modelers to determine how best to make use of the voluminous advanced data that NPOESS satellites will provide. In the past, it has taken up to two years for weather forecasters to learn how to adapt their models to use data from new NOAA satellites. Because NPP will provide NOAA with 93 percent of the data that NPOESS satellites are expected to deliver, the test satellite will allow users to take full advantage of NPOESS almost immediately after launch.

Figure 1. NPOESS Program's Management Structure.



A History of Problems with NPOESS

NPOESS has a history of budget and technical problems (see the hearing by the Science Committee's Subcommittee on Environment, Technology and Standards in July 2003, available at *http://www.house.gov/science/*). When first conceived in 1994, NPOESS was expected to cost $6.5 billion, a savings of $1.8 billion compared to the cost of separately developing new satellite systems for military and civilian use. The NPP test satellite was originally expected to be ready for launch in May 2006, while the first operational NPOESS, the C–1 satellite, was to be available for launch in June 2008.

The government and contractors drew up a new cost estimate and schedule for NPOESS (known as a "rebaselining") early last year to take into account funding cutbacks in FY 2003 (by Congress) and FY 2004 (by the Administration). Under the new baseline, the total expected cost of the program rose by $900 million (to $7.4 billion) and the schedule was delayed by several months: NPP would be launched in October 2006 and NPOESS C–1 would launch in February 2009.

In November 2004, major technical and engineering problems emerged with one of the key sensors, known as VIIRS (pronounced like "veers," the instrument is a type of infrared camera used to collect images of clouds and to probe sea surface temperature, an important aspect of hurricane prediction). NOAA said at the time that the problems with VIIRS required a further delay in schedule—this time, limited to the NPP satellite—of more than a year (to April 2008). In response to the

problems with the sensor, Raytheon, the subcontractor building VIIRS, fired its entire technical team working on the instrument and put new staff on the task. (VIIRS is not the only sensor on NPOESS that is having problems, but its troubles have been the most problematic thus far.)

NOAA and IPO officials stated publicly at that time that the effect of the problems were limited to NPP and would not delay the launches of the other satellites or significantly increase the cost of the program as a whole. IPO officials repeated that message to Committee staff at a briefing on March 23, 2005.

But earlier in March, NPOESS contractor Northrop-Grumman told IPO officials that delays in NPOESS might be required. And on March 31, Northrop-Grumman gave a comprehensive briefing to IPO officials concluding that problems with the NPOESS satellite program had grown so severe that meeting the rebaselined costs and schedule was unlikely. (NOAA never reported this information to the Congress, although rumors began circulating at the time. Some of the details have emerged from government documents requested by the Science Committee.)

Beginning in April, Committee staff requested briefings from NOAA on the problems the program was rumored to be facing, but NOAA officials delayed scheduling any briefings, and canceled one briefing after it had been scheduled. Northrop-Grumman, too, canceled a briefing for Committee staff soon after it had been scheduled. The Committee was unable to get a briefing on the status of the program until July 28, when, in response to demands by the Chairmen and Ranking Members of the Science Committee and its Subcommittee on Environment, Technology and Standards, the Administrator of NOAA met with the four Members.

On August 5, NOAA and IPO officials briefed Committee staff in more detail about the problems plaguing the satellite program. At that meeting, IPO officials told Committee staff that the IPO did not become aware of the severity of NPOESS' problems until May—in reality, almost two months after the IPO had received Northrop-Grumman's briefing, according to documents provided to the Committee.

The Committee then sent a letter to NOAA (dated August 12) requesting documents relating to the problems with the NPOESS and NPP programs and when government officials learned of them. Initially, NOAA responded only partially to the request. On October 20, the Committee sent another letter following up on the first. Last Thursday, NOAA began providing the additional documents and, while it has yet to comply completely with the request, NOAA now seems to be cooperating with the Committee's investigation.

What Went Wrong

In retrospect at least, it seems clear that the government and the contractor did not fully appreciate the complexities inherent in building VIIRS. These difficulties should have been noted at the Critical Design Review, a key step in moving ahead with a satellite, which for VIIRS occurred in early 2002. Northrop-Grumman now says that it had assumed that because some aspects of VIIRS were based on existing instruments, developing the sensor as a whole would be simpler than it has turned out to be. Raytheon contends that it was aware of the aspects of VIIRS that could cause problems during development, but clearly its bid did not accommodate the problems that were to occur. Both contractors agree that their bids, following what they say is standard practice, had about a 50 percent confidence level—that is, the contractors assumed there would be a 50 percent chance that their cost estimates would be accurate, and they provided reserve funds for the project accordingly. Those reserves have proven to be inadequate and have already been entirely consumed. The agencies and the contractors are now getting ready to rebaseline the program again, and the agencies have said they want the new cost estimates to be based, in effect, on an 80 percent confidence level.

Industry officials appear to agree now that the government should have required more proof that the design for building the VIIRS instrument was sound when it conducted the instrument's Critical Design Review, the stage in the development of VIIRS when the government gave the final go-ahead to build a major piece of equipment.

In addition, problems occurred with VIIRS because the initial technical team working on the instrument for Raytheon had never worked on an operational satellite before, having conducted all their work building research satellites. But operational satellite development must be managed much more strictly than one-of-a-kind research satellites. Any schedule slips that may arise in the development of research satellites merely delay the research to be done. But schedule slips in operational weather satellites can have much more serious consequences (see below for more details).

Options for NPOESS

When Northrop-Grumman notified the government in March 2005 that the NPOESS satellites could no longer be developed on time and within budget, the government's leading officials overseeing the NPOESS program, the agencies began another review of the program.

The top officials in charge of the project, the EXCOM, met in August and October to consider options, but has yet to make a final decision on how to move forward with the satellite program. It is scheduled to meet again next Tuesday.

In general, the government has several options: it can dedicate more money to the program to pay for additional people and work necessary to solve the satellite's technical problems; it can stretch the production schedule to give the existing workforce time to solve the problems; it can scale back the satellite's capabilities by eliminating individual sensors or other aspects of the program to free up money and workforce to focus on the technical problems; or any combination of the three.

According to documents NOAA has provided, the EXCOM has ruled out eliminating NPP or one of the six NPOESS satellites. It also has ruled out providing any additional money to NPOESS for fiscal years 2006 and 2007. It is unclear why the EXCOM is unwilling to seek more funding before FY 2008. Internal Pentagon rules make it more difficult for the Air Force to shift funds among programs and the current Air Force satellites have more years of service left than NOAA's do.

Instead of providing additional funding, the EXCOM plans to slow down the development of some of NPOESS' other instruments to pay for the increased work necessary to fix the problems with VIIRS. In addition, the EXCOM is considering delaying the delivery dates of some sensors and has already eliminated at least one other (the Landsat imager) altogether. (The Landsat instrument will probably be flown separately; a decision is pending. Previous Landsat instruments flew separately, but this one was moved to NPOESS to save money, among other reasons.)

Of the options the EXCOM is considering, all would delay the availability of NPP by at least 30 months (to April 2009), and all would delay the availability of the NPOESS C–1 satellite by at least 36 months (to sometime in 2012).

Implications of the Options for NPOESS

A delay in the delivery of NPOESS could lead to a gap in coverage of the U.S. by civilian polar-orbiting weather satellites. NOAA plans to launch the last its POES polar-orbiting satellite in December 2007. It is NOAA's policy always to have a replacement satellite on hand to cover the possibility that the original will fail upon launch. Originally, NPOESS C–1 was to be available in case the last POES satellite failed. But under the options the EXCOM now has under consideration, the new satellite will not be ready until 50 months later (because of previous delays as well as the current one), potentially exposing the U.S. to a gap in civilian coverage of more than four years.

Complicating the situation further, as it finished building this last POES satellite in 2003, the contractor, Lockheed-Martin dropped it on the floor of the assembly plant, causing significant damage (see below for more information). Lockheed-Martin is repairing the satellite's components with spare parts, but has yet to fully test the satellite. As a result, it is unknown whether the fall has increased the likelihood that the satellite will fail.

The military expects to be able to make its satellites last well past the 2012 NPOESS launch date. But the military satellites do not provide the complete global coverage required by NOAA. Also, the military does use some data that are available only from NOAA's satellites. It is unclear how the potential gap could affect the military.

Also unclear is whether NOAA could rely on European weather satellites because it is not certain that the data produced by the sensors on European satellites are compatible with U.S. weather forecast models, or that these satellites would even be available.

To minimize the potential consequences of such a gap in coverage, the EXCOM reportedly is considering bolstering the capabilities of the NPP satellite. Rather than simply providing a platform to test the crucial sensors planned to fly aboard NPOESS satellites later, the NPP satellite could be made to operate more like an operational satellite, albeit with a limited suite of instruments. It is unclear how much more expensive such a modification would be. Furthermore, because in the past it has taken up to two years for weather forecasters to learn how to adapt their models to use data from new instruments, it is unclear how long it could take for NPP to be useful for weather prediction.

Fixing the problems facing NPOESS will increase the lifetime costs of the satellite program by at least $1 billion, and perhaps as much as $3 billion. Part of the increase in cost is due strictly to the EXCOM's decision not to spend any additional

money in FY 2006 and 2007 because extending the duration of a program that employs a large workforce necessarily increases labor costs. According to Northrop-Grumman, providing additional funding in fiscal years 2006 and 2007 could significantly reduce the lifetime cost of the NPOESS program. NOAA officials have said that they expect to increase funding for the program in FY 2008, but it is not clear whether the budget climate then will be more favorable to making additional funding available.

Nunn-McCurdy Notification

The NPOESS contract follows DOD acquisition procedures. As a result, it is subject to the Nunn-McCurdy provisions of the DOD acquisition regulatory process (10 U.S.C. 2433). The law establishes reporting requirements in cases where cost overruns occur in major defense acquisition programs. If a program manager has reasonable cause to believe that costs will increase more than 15 percent over the most recent baseline estimate, DOD must notify Congress. If costs increase more than 25 percent, the Secretary of Defense (or the Secretary of the appropriate branch of the military) has 30 days to certify the program, otherwise no funds may be obligating for the program. Certification requires a written justification that the program is essential to the Nation's security, that there are no alternatives to the program, that the new cost estimates are reasonable, and that the management structure is adequate.

On September 29, 2005, the Secretary of the Air Force notified Congress that the NPOESS program would exceed the 15 percent Nunn-McCurdy notification threshold (meaning that acquisition costs would increase by at least $1 billion over the program's most recent cost estimate of $7.4 billion). The Air Force initiated an Independent Program Assessment to review the technical and cost baselines of the program and to develop options for moving forward. (Documents prepared by the Independent Program Assessment, which is being conducted by the Aerospace Corporation, are is the source of much of the cost and option information in this charter. The Committee received the documents in response to its recent request.) The final results of the Assessment are expect at the EXCOM meeting next week.

Other Satellite Problems

This is not the first time a NOAA satellite program has experienced major cost overruns, technical problems or management issues. In September 2003, lax government oversight of, and lax contractor oversight by Lockheed-Martin resulted in a major accident in the POES-production facility. (The program is overseen by NASA under an agreement with NOAA.) The final satellite in the POES series fell off of its platform because Lockheed-Martin employees did not follow standard procedures and check that all the bolts were in place before moving the satellite. During the late 1980s, another major satellite acquisition program at NOAA, GOES–NEXT, ran $1.4 billion over budget and five years behind schedule due to a lack of technical planning and program development delays. GOES–NEXT's problems were similar to those that NPOESS is experiencing now. As a result of those problems, NOAA was forced to rely on a single GOES satellite from 1989 through 1992, when normally it uses two satellites. Had the one satellite failed, NOAA would have been unable track severe weather in real time or provide continuous weather coverage of the United States. Delays in NPOESS could result in the Nation running similar risks.

Questions for Witnesses

The witnesses were asked to address the following questions in their testimony:

Vice Admiral Conrad C. Lautenbacher, Jr. (Ret.)

1. What is your current estimate of the cost and launch date for the first NPOESS satellite compared to the September 2003 baseline ($7.4 billion and November 2009)? What steps need to be taken to firm up the cost and schedule estimate and when will an official new baseline be available?
2. What program options are being considered in response to the increased cost and schedule delays? Do any of these options involve scaling back the capability of the NPOESS satellite? Would such scaling back affect the plans of other agencies to fly sensors on NPOESS?
3. It is our understanding that no options are being considered that increase spending in Fiscal Year (FY) 2006 or FY 2007. Why is that the case? Will delaying action until FY 2008 increase the lifetime cost of the NPOESS program and increase the risk that the satellite will not be ready in time to perform its mission? Is the decision to not increase spending driven purely by near-term Federal budget constraints? If so, why is NOAA assuming that funding will be more available in FY 2008?

4. If the last satellite from the current NOAA polar series fails during launch or in orbit, then, given the schedule delays anticipated for NPOESS, there could be a 19- to 36-month gap in polar satellite coverage for NOAA. If a coverage gap were to occur, what are the implications for NOAA weather forecasting capabilities? What are NOAA's contingency plans for a gap in polar satellite coverage?

Dr. Ronald M. Sega

1. What is your current estimate of the cost and launch date for the first NPOESS satellite compared to the September 2003 baseline ($7.4 billion and November 2009)? What steps need to be taken to firm up the cost and schedule estimate and when will an official new baseline be available?
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3. It is our understanding that no options are being considered that increase spending in Fiscal Year (FY) 2006 or FY 2007. Why is that the case? Will delaying action until FY 2008 increase the lifetime cost of the NPOESS program and increase the risk that the satellite will not be ready in time to perform its mission? Is the decision to not increase spending driven purely by near-term Federal budget constraints? If so, why is the Air Force assuming that funding will be more available in FY 2008?
4. If the last satellite from the current NOAA polar series fails during launch or in orbit, then, given the schedule delays anticipated for NPOESS, there could be a 19- to 36-month gap in polar satellite coverage for NOAA. If a coverage gap in NOAA satellites were to occur, what are the implications for the Air Force and/or the Department of Defense weather forecasting capabilities? What are the contingency plans for a gap in polar satellite coverage? Is the Air Force's capability to forecast weather as vulnerable to delays in NPOESS as NOAA's is?

Mr. David Powner

1. What is your current estimate of the cost and launch date for the first NPOESS satellite compared to the September 2003 baseline ($7.4 billion and November 2009)?
2. What program options should be considered in response to the increased cost and schedule delays?
3. It is our understanding that no options are being considered that increase spending in Fiscal Year (FY) 2006 or FY 2007. Will delaying action until FY 2008 increase the lifetime cost of the NPOESS program and increase the risk that the satellite will not be ready in time to perform its mission?
4. What are the major technical and program management risks still facing the NPOESS program?

Dr. Alexis Livanos

1. What is your current estimate of the cost and launch date for the first NPOESS satellite compared to the September 2003 baseline ($7.4 billion and November 2009)? What steps need to be taken to firm up the cost and schedule estimate and when will an official new baseline be available?
2. What is Northrop-Grumman Space Technology (NGST) doing to address the technical problems, cost overruns and schedule delays in the NPOESS program? In particular, what changes has the company implemented or will it implement in its oversight of subcontractors to address the technical problems, cost overruns and schedule delays in the NPOESS program?
3. Have you recommended NPOESS program options to the Federal Government in response to the cost increases and schedule delays? If so, what are those options? Are there other major options you think should be considered by the government?
4. It is our understanding that the Federal Government is not considering any options that increase spending in Fiscal Year (FY) 2006 or FY 2007. What are the pros and cons of waiting until FY 2008 to provide additional funding to the NPOESS program? If Congress provided additional funding in FY

2006 or FY 2007, what could be accomplished to minimize lifetime cost increases and schedule delays?

Appendix 1: NPOESS Instrument Definition and Status (* indicates an NPP sensor)

NPOESS Instrument (Contractor)	**Acronym meaning**	**Description**	**Status as of November 2005**
VIIRS* (Raytheon)	Visible Infrared Imager Radiometer Suite	Visible and infrared imager for imaging clouds, sea surface temperature, etc. Upgrade of a NASA sensor, MODIS, and current POES sensor, AVHRR.	Major technical problems in September 2004 led to entire team being fired. Delivery will be delayed at least 18 months until April 2008.
CrIS* (ITT)	Cross-track Infrared Sounder	Provides high resolution atmospheric temperature and moisture profiles for long-range weather prediction.	Will be ready for integration onto NPP spacecraft in early 2006.
ATMS* (Northrop-Grumman thru a NASA contract)	Advanced Technology Microwave Sounder	Microwave sounder that is a companion to CrIS. Together CrIS and ATMS combine three old NASA sensors.	Ready to ship for integration onto NPP spacecraft.
OMPS* (Ball)	Ozone Mapping and Profiler Suite	Ozone and wind prediction.	Ready for integration onto NPP spacecraft in fall 2006. Still facing some technical problems.
CMIS (Boeing)	Conical Scanning Microwave Imager/Sounder	Microwave imager to collect data about atmospheric temperature and moisture, clouds, and sea surface winds. Based on old NASA satellites known as TRMM and Windsat.	Facing major delays due to funding restraints.
GPSOS (Saab Ericsson)	Global Positioning System Occultation Sensor	GPS	On schedule
ADCS (Northop-Grumman)	Advanced Data Collection System	Data collection	On schedule
SESS (Ball)	Space Environment Sensor Suite	Measures for disturbances from solar flares, which can disrupt communications systems and electric power grids	On schedule
APS (Raytheon)	Aerosol Polarimetry Sensor	Aerosols and climate change	On schedule
SARSAT	Search and Rescue Satellite-Aided Tracking	Search and rescue	On schedule
TSIS (Univ. Colorado)	Total Solar Irradiance Sensor	Solar irradiance to understand climate change	On schedule
ERBS (Northrop-Grumman)	Earth Radiation Budget Suite	Earth radiation to understand climate change	On schedule
ALT (Alcatel)	Radar Altimeter	Ocean currents and depths	On schedule
SS		Survivability monitor	On schedule

Appendix 2: Acronym list

NPOESS: National Polar-orbiting Operational Environmental Satellite System

C-1 to C-6: The six NPOESS satellites

NPP: NPOESS Preparatory Project

POES N: Polar Operational Environmental Satellite N, current NOAA polar satellite

POES N': Polar Operational Environmental Satellite N', last of current NOAA polar satellites planned for launch in December 2007

DMSP: Defense Meteorological Satellite Program

F17 to F20: The remaining DMSP satellites

IPO: Integrated Program Office

EXCOM: NPOESS Executive Committee (Air Force, NOAA, and NASA)

Chairman BOEHLERT. The hearing will come to order.

I want to welcome everyone this morning to this important hearing on the NPOESS satellite program, a vital but troubled effort that we desperately need to get back on track.

We hope to have a detailed discussion this morning of what's gone wrong with the program and how to fix it. But before we get into the potentially confusing specifics of acronyms and dates and bureaucratic structure, I want to remind everyone how much is at stake.

NPOESS is an absolutely essential program for the safety and security of the United States. Without polar satellites, we pretty much lose the ability to understand longer-term weather trends, and our knowledge from those trends can save lives. The specifics of NPOESS may be technical and abstruse, but this is a program that provides information that every single American can use in their daily lives, and information that may be needed to save those lives. That is not an abstract matter.

You would think that, given how much is riding on NPOESS, that this would be an especially closely supervised, well managed program. You would think that, given the cost and prominence of NPOESS, that this would be a program in which Congress was given clear, accurate, and timely information to help keep the program adequately funded and on track.

But sadly, none of this has been the case. It is now clear that, almost from the outset, decisions were made with too little analysis of the technical challenges involved in building NPOESS. It is clear that contracts were awarded at prices that did not take into account the technical risks the program faced. And it is clear that the program was inadequately supervised, allowing problems to fester and worsen before being addressed. What's not so clear is whether these inadequacies are behind us, and that's part of what we will focus on today.

It is also clear that NOAA, in particular, has repeatedly withheld critical information from this committee and the American people. Even in today's prepared testimony, NOAA is less direct and forthright in its assessment of the program and its options than are the other witnesses. That is absolutely unacceptable.

The American taxpayer is now going to pay as much as $9 billion, maybe even more, for the NPOESS satellites at a time of fiscal stringency. Congress has to fully understand the costs of this program and the options for how the program can proceed. Ultimately, it is Congress that decides how much the Nation can spend on NPOESS and what it will get for its money. No one is helped if we have to do that "in the dark."

And so today, we are going to closely review the options for getting the NPOESS program back on track. I know that the agencies and contractors are still in the process of reviewing those options. That is not a reason to avoid a full and open discussion today, before final decisions are made. For too long, Congress has been given information only after decisions have been made.

No one on our panel today should think that this committee will accept answers at this hearing like, "We are reviewing our options," or "We don't have all the information yet." You can qualify

your answers with phrases like that, but you will not be allowed to simply avoid answering the fundamental questions before us.

One of those questions is why the agencies are not now considering putting more money into this program this year and next year instead of waiting until fiscal year 2008. Such a strategy will add to launch delays, increase total costs, and possibly complicate efforts to get the sensors working properly. As far as I can tell, the only thing fiscal year 2008 has to recommend itself is that it isn't here yet. I don't think anyone believes that the Federal Government will be flush with cash in fiscal year 2008.

As I said at our hearing on NASA, "wait until next year" is a good mantra for baseball fans, but it is a lousy strategy for budgeting. So we are going to pursue the question of funding forcefully today.

I hope we will come away from this hearing with a clear understanding of what the options are for the future of NPOESS, of how and when they will be fully evaluated, and of how this committee will be kept informed of that information. We are going to be following this program like hawks, and we do not want to learn of decisions after they are made.

Today should be, and better be, the start of a new era for the NPOESS program, an era that will be characterized by close program management and a free flow of information. This should not be one of a series of hearings on what went wrong with NPOESS. We need to set out a plan today to put NPOESS back on track, because lives are at stake.

[The prepared statement of Chairman Boehlert follows:]

PREPARED STATEMENT OF CHAIRMAN SHERWOOD L. BOEHLERT

I want to welcome everyone this morning to this important hearing on the NPOESS satellite program, a vital, but troubled effort that we desperately need to get back on track.

We hope to have a detailed discussion this morning of what's gone wrong with the program and how to fix it. But before we get into the potentially confusing specifics of acronyms and dates and bureaucratic structure, I want to remind everyone how much is at stake.

NPOESS is an absolutely essential program for the safety and security of the United States. Without polar satellites, we pretty much lose the ability to understand longer-term weather trends, and our knowledge of those trends can save lives. The specifics of NPOESS may be technical and abstruse, but this is a program that provides information that average Americans use in their daily lives—and information that may be needed to save their lives. This is not an abstract matter.

You would think that, given how much is riding on NPOESS, that this would be an especially closely supervised, well managed program. You would think that, given the cost and prominence of NPOESS, that this would be a program in which Congress was given clear, accurate and timely information to help keep the program adequately funded and on track.

But none of this has been the case. It is now clear that, almost from the outset, decisions were made with too little analysis of the technical challenges involved in building NPOESS. It is clear that contracts were awarded at prices that did not take into account the technical risks the program faced. And it is clear that the program was inadequately supervised, allowing problems to fester and worsen before being addressed. What's not so clear is whether these inadequacies are behind us, and that's part of what we will focus on today.

It's also clear that NOAA, in particular, has repeatedly withheld critical information from this committee and the American people. Even in today's prepared testimony, NOAA is less direct and forthright in its assessment of the program and its options than are the other witnesses. This is absolutely unacceptable.

The American taxpayer is now going to pay as much as $9 billion, maybe even more, for the NPOESS satellites at a time of fiscal stringency. Congress has to fully

understand the costs of this program and the options for how to the program can proceed. Ultimately, it is Congress that decides how much the Nation can spend on NPOESS and what it will get for its money. No one is helped if we have to do that "in the dark."

And so today, we are going to closely review the options for getting the NPOESS program back on track. I know that the agencies and contractors are still in the process of reviewing those options. That is not a reason to avoid a full and open discussion today—before final decisions are made. For too long, Congress has been given information only after decisions have been made.

No one on our panel today should think that this committee will accept answers at this hearing like "we are reviewing our options" or "we don't have all the information yet." You can qualify your answers with phrases like that, but you will not be allowed to simply avoid answering the fundamental questions before us.

One of those questions is why the agencies are not now considering putting more money into this program this year and next year instead of waiting until fiscal 2008. Such a strategy will add to launch delays, increase total costs, and possibly complicate efforts to get the sensors working properly. As far as I can tell, the only thing fiscal 2008 has to recommend itself, is that it isn't here yet. I don't think anyone believes that the Federal Government will be flush with cash in fiscal 2008.

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Today should be—had better be—the start of a new era for the NPOESS program—an era that will be characterized by close program management and a free flow of information. This should not be one in a series of hearings on what went wrong with NPOESS. We need to set out a plan today to put NPOESS back on track because lives are at stake.

Chairman BOEHLERT. And with that, the Chair is pleased to recognize the distinguished gentleman from Tennessee, Mr. Gordon.

Mr. GORDON. Thank you, Mr. Chairman.

And let me first say, in your five years as Chairman, a good five years as a good Chairman, that is the most direct and toughest opening statement that I have ever heard you make, and let me say that I concur and that you have bipartisan support on those comments.

None of us like coming here today to talk about a program that is in trouble, but that is what we get paid to do. We are here today to discuss the National Polar-orbiting Operational Environmental Satellite System, NPOESS, an important joint environmental satellite program for NOAA and DOD with serious problems.

Admiral Lautenbacher, you met with me, Mr. Boehlert, Mr. Ehlers, and Mr. Wu in late July to assure us of your cooperation. At that time, we heard that the cost overrun on this program could be as high as a billion dollars.

You were right to warn us those numbers were not robust and to take them with a grain of salt. That is the good news. The bad news is that as the numbers became more robust, the costs kept climbing.

The Executive Committee's own Independent Program Assessment Team has suggested that the real cost overrun is in the range of $2 billion to $3 billion.

A potential $3 billion cost overrun on a $6.5 billion program is simply incredible. And what is disheartening, just the other day, we had an important hearing where Norm Augustine told us about the needs for our future and how we could put forth really an im-

provement for the quality of life for our kids and really hope that we can save them from what I am afraid will be a standard of living less than their parents have and less than we inherited from our grandparents. His suggestion for funding that was about $5 billion to get our science, technology, and math up and going in this country. And we are—but we couldn't do it. We don't have the money. And yet, we are wasting $3 billion here. It is disheartening, and I think that that is the reason that you have such strong feelings on the Committee today.

But regardless of whether you look at the contractor projections of the paths out of this mess or the Independent Team's assessments, the least costly solutions all require more money in fiscal year 2006 and fiscal year 2007 than called for in the baseline. That finding reinforces what the contractor on this project also says.

The one consistent message you have delivered to Congress, and to the Director—the direction to contractors and the Independent Assessment Team, was that no new money could be pursued in the next two fiscal years.

It looks to me as if you are willing to play out the clock so that you can get through your term at NOAA without having to do the hard work of asking OMB and Congress to free up some more money to save us money later on.

Decisions about how to move forward seem to be painfully slow in coming. The longer it takes to settle on a solution, the fewer options we have and the more expensive they become.

Perhaps it is politics driving this behavior, perhaps it is weak management, or perhaps there is a good reason for this slow march towards solutions.

According to the EXCOM's Independent Program Assessment Team, the difference between more money next year and no money until fiscal year 2008 is a billion dollars over the life of the program. The taxpayer is ill served by limiting options to those that are convenient for this Administration.

I want to urge you in the strongest possible terms to look at options that minimize total program costs, delivers satellites in time to avoid data gaps, and that offers the least risk of additional "surprises."

If you are unwilling to do that, I think you have to explain to this committee why the Administration prefers an approach that would cost the taxpayers a billion dollars more than other approaches and risks the continuity of vital weather forecasting data.

I want to remind you that you promised in the July meeting that we would enjoy real cooperation from NOAA. I am disappointed in that record so far.

For example, six weeks ago, you received your Independent Program Assessment Team's report showing that the projected cost overruns would range between $2 billion and $3 billion. That event should have triggered a call to our staff or even directly to Members. Maybe you don't consider a growth in cost overrun projections from $700 million to $3 billion to be a big deal, but I do.

Another example of lack of cooperation lies in complying with our document request. We wrote on August 12 for documents and have sent a follow-up letter, and we still do not have all of the documents.

This committee has the right and responsibility to understand what went wrong with this program and to weigh options to move forward. We must be able to advise our colleagues on the Appropriations Committee about how to proceed.

I intend to see our document request fully complied with even if it requires a subpoena from this committee to do it.

I trust that everyone understands that this would be about—not about politics but about our institutional rights and obligations.

I believe that you have not yet lived up to your pledge of full cooperation in July. It puts you in a somewhat difficult position as you come before us today to assure us that you are leading the agency in a manner to solve these problems. I hope we can move forward in a cooperative manner from here on out.

Thank you for being here with us this morning.

[The prepared statement of Mr. Gordon follows:]

PREPARED STATEMENT OF REPRESENTATIVE BART GORDON

None of us like coming together to talk about a program that is in trouble, but that is what we get paid to do. We are here today to discuss the National Polar-orbiting Operational Environmental Satellite System—NPOESS—an important joint environmental satellite program for NOAA and DOD with serious problems.

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Thank you all for being here this morning. I look forward to your testimony.

Chairman BOEHLERT. Thank you very much, Mr. Gordon.

The Chair recognizes Dr. Ehlers.

Mr. EHLERS. Thank you, Chairman Boehlert.

I am pleased that the Committee is holding this important hearing today.

This year's tragic hurricane season reminded all of us that the United States is highly vulnerable to severe weather events. Weather satellites, such as NPOESS, provide vital data for three- to seven-day forecasts of severe weather, including hurricanes. We desperately need these new satellites to allow us to do an even better job of forecasting. Unfortunately, the NPOESS program has a history of major problems. It already experienced one major contract re-plan that in 2003 delayed the program by 10 months and increased the cost by $900 million.

Two years ago, I held a hearing in the Environment Subcommittee about these problems with NPOESS. At that hearing, officials from NOAA and the Air Force assured me that they were doing everything they could to minimize future cost overruns and schedule delays. Yet, here we are today facing an additional three-year delay and up to $3 billion in increased costs. I hope the witnesses explain how we got to this point with NPOESS, what they plan to do to get this important program back on track, and what lessons we have learned for improving the Federal Government's approach to the weather satellite programs. We simply cannot continue doing business this way.

Like Chairman Boehlert, I have some specific concerns I hope the witnesses will address today. For example, if this program is so far off track now, why are we waiting until fiscal year 2008 to consider adding funds to it? Also, due to the delays in NPOESS, the United States faces up to a four-year gap in polar satellite coverage. I want to know how a gap would degrade our ability to forecast hurricanes, and if there are contingency plans for that situation. It is urgent for us to get these new satellites up. The added cost of getting the NPOESS program back on track rapidly is minuscule compared to the damage and lives lost we would incur if we no longer can forecast severe weather, such as hurricanes, accurately.

These are just a few of the issues I look forward to discussing today. I thank the witnesses for being here and yield back the balance of my time.

[The prepared statement of Mr. Ehlers follows:]

PREPARED STATEMENT OF REPRESENTATIVE VERNON J. EHLERS

Thank you Chairman Boehlert. I am pleased that the Committee is holding this important hearing today.

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These are just a few of the issues I look forward to discussing today. I thank the witnesses for being here and yield back the balance of my time.

Chairman BOEHLERT. Thank you very much, Dr. Ehlers.

Mr. Wu.

Mr. WU. Thank you very much, Mr. Chairman.

My message to my colleagues and the witnesses this morning is not very much different from that of my colleagues who have already spoken. We are united in our concern for this program, and we are very determined to obtain the information that we need to properly exert Congress's oversight function and move forward in an expeditious manner.

After our all-hands meeting in July, I thought that we were turning toward a new page or turning over a new page, and entering a phase of cooperation and adequate information sharing so that we could all do our jobs. Unfortunately, we still seem to have a communications problem with NOAA. And quite frankly, I am not sure whether that is due to decision-making of NOAA or, as they say, at the pay grade above yours, but wherever the blockage is, I would like to identify why there is a problem in information exchange between this staff, the staff of this committee, and this committee, and your staff, and the folks who can provide us with that information.

I have to add that this blockage in information seems to be between the Executive Branch and the Legislative Branch. And cooperation between the private contractor and this committee has been exemplary thus far. And I have a hard time understanding why the Executive Branch seems to have a problem in permitting this body to exercise its constitutional duties.

From the inception of this program, its oversight has been conducted in a bipartisan, and in fact, one could say a nonpartisan fashion. This committee is interested in one outcome only, the

timely deployment of a functioning weather satellite that serves the least possible cost and the most possible function to the American taxpayer.

Right now, we do not appear to be on that path, and we would like to work with you to return to that path. I am very concerned about the cost estimates and cost overruns that we are hearing about, but we are unable to look further into it because of a lack of information.

Even stretched out over several fiscal cycles, the additional funds NOAA will need to cover these cost overruns have grave implications for other programs, other very important programs, in the agency.

In addition to resolving the problems of the NPOESS program, I would like to have some assurance that NOAA has learned some lessons from this NPOESS experience and will be applying them aggressively as we pursue development of a new geostationary satellite series.

I believe the GAO team that has been following the NPOESS program will have some constructive suggestions for us in that regard. We need to get this program back on track, and we need to get our relationship back on track. We need a path forward that will hold the costs down and deliver the satellites in a time period that ensures continuity of weather forecasting data. If we can't do that in a friendly, cooperative way, there are other tools available, and I don't think any of us look forward to resorting to those.

I hope we can proceed from this point onward in a cooperative manner to achieve our important collective goals.

I yield back the balance of my time.

Chairman BOEHLERT. Thank you very much, Mr. Wu.

For the purpose of a colloquy, the Chair yields to Mr. Gordon.

Mr. GORDON. Mr. Chairman, before we begin with the questions, I would like to note the Science Committee, during your chairmanship, has rarely ever sworn in witnesses for its hearing. I believe, however, that a five-year prison sentence or fine to be against any person who knowingly and willfully covers up material facts, makes false statements, or uses documents containing false information in the course of any investigation or review conducted pursuant to the authority of any Committee or Subcommittee of the Congress, consistent with the applicable rules of the House or Senate and the terms of Title XVIII, Section 1001 of the United States Code. Is that your understanding, Mr. Chairman?

Chairman BOEHLERT. It certainly is. Thank you very much.

And now with that, all of the Members will be given an opportunity to insert their opening statements in the record at this juncture.

[The prepared statement of Mr. Costello follows:

PREPARED STATEMENT OF REPRESENTATIVE JERRY F. COSTELLO

Good morning. I want to thank the witnesses for appearing before our committee to examine the ongoing problems and future plans for the National Oceanic and Atmospheric Administration's (NOAA) key weather satellite program, the National Polar-orbiting Operational Environmental Satellite System program (NPOESS). This program was initiated as a tri-agency program (NOAA—DOD—NASA) during the Clinton Administration. The new polar satellite series will replace two separate satellite series that are now managed by NOAA (POES) and DOD (DMSP) to obtain weather data that are fed into weather forecasting models.

The original intention of this combined program was to develop and deploy a joint civilian and military satellite system thereby saving costs by purchasing one system instead of two. Unfortunately, the anticipated cost savings have not been realized. The program is now behind schedule and over budget. The NPOESS satellite series was anticipated to be launched in time to provide a back up for the final satellites in the POES (NOAA—civilian) and DMSP (DOD—military) series. Technical challenges with several of the key sensors and interruptions in the originally planned funding stream for the program have resulted in schedule changes that will delay the launch of the first satellite in the NPOESS series by over one year. I am concerned that if the final POES satellite does not perform or is lost during launch, NOAA could be faced with a period in which we are unable to receive meteorological data from polar satellites because the first NPOESS satellite will not be available as a backup.

I am pleased the oversight of this program has been conducted in a bipartisan fashion and I commend Chairman Ehlers and previous Ranking Member Udall and current Ranking Member Wu of the Environment, Technology, and Standards Subcommittee for following the development of this program since the fall of 2001. Member and staff meetings have been conducted and document requests from the Administration were issued together. I am concerned that the Administration has repeatedly failed to notify the Committee as problems have mounted with this program and document requests have not been honored in a timely fashion or with complete information.

It is my understanding that the Administration is examining a series of options for re-planning this program to address cost, schedule and technical issues that have arisen with development of the specialized sensors. This would push the financial problems associated with the program into the next Administration because no spending options are available in FY06 through FY08. Greater schedule delays, means a higher risk of data loses, and a higher total program costs, which troubles me.

I look forward to hearing from the panel of witnesses.

[The prepared statement of Ms. Johnson follows:

PREPARED STATEMENT OF REPRESENTATIVE EDDIE BERNICE JOHNSON

Thank you, Mr. Chairman and Ranking Member.

Environmental and weather research is important, and the National Oceanographic and Atmospheric Association plays a key role in this area.

National Polar-orbiting Operational Environmental Satellite System (NPOESS) satellites will be important in developing three- to seven-day weather forecasts and for predicting severe weather, such as hurricanes.

The technology will enable the satellites to measure ocean winds to help predict El Niño and aid the military's operation of aircraft carriers.

These Satellites will be able to measure soil moisture, track fish populations and ocean-borne pollution as well as help the military sweep for mines.

It is my hope that the NPOESS program will continue running and avoid gaps in satellite coverage. My colleagues on the Science Committee and I would like to know how we can help develop sound policies to help, not harm our nation's satellite technology development.

Thank you, Mr. Chairman. I yield back.

[The prepared statement of Mr. Carnahan follows:

PREPARED STATEMENT OF REPRESENTATIVE RUSS CARNAHAN

Chairman Boehlert and Ranking Member Gordon, thank you once again for hosting this hearing. Admiral Lautenbacher, Dr. Sega, Mr. Powner, and Dr. Livianos, thank you for taking the time and effort to appear before us today and share your views on NOAA's polar satellite program.

I am very concerned, as are all my colleagues, about the anticipated overrun cost of the National Polar Orbiting Environmental Satellite System (NPOESS). NOAA's satellite systems are invaluable for long-term weather forecasting and predicting severe weather systems. This year's hurricane season is a drastic example of the importance of predicting severe weather storms.

I am eager to learn more about the Administration's plans for dealing with the overrun cost situation during today's oversight hearing. We must also ensure that the cost overrun does not affect the effective operation of the satellite system.

Thank you for your time today. I look forward to hearing your testimony.

Chairman BOEHLERT. And we welcome our very distinguished panel of witnesses, with whom we enjoy good, constructive working relationships in a variety of capacities.

First, Vice Admiral Conrad C. Lautenbacher, Jr., Administrator, National Oceanic and Atmospheric Administration; Dr. Ronald M. Sega, Under Secretary for the Air Force. And for the purposes of the record, it should be noted that Dr. Sega is in this new and most important job since August of this year. This is the situation he inherited. Dr. Alexis Livanos, President, Northrop Grumman Space Technology. And Dr. Livanos, let me personally thank you for the way in which you, as a contractor, and your associates have come forward with valuable information that has help guide the Committee's deliberations. And Mr. David Powner, Director of Information Technology Management Issues, the Government Accountability Office. And you perform the way we expect GAO to perform, and we thank you very much for your service.

The witnesses will be asked to give us an opening statement. The Chair is not arbitrary. You are the only panel before us today. We would hope you would summarize your opening statement, and then we could get right to the meat of the hearing to exchange the dialogue between the panelists and those of us who are trying to seek more information and help chart a course that will get us back on the right track.

With that, Admiral Lautenbacher, you are up.

STATEMENT OF VICE ADMIRAL CONRAD C. LAUTENBACHER, JR. (RET.), ADMINISTRATOR, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)

Vice Admiral LAUTENBACHER. Thank you, Mr. Chairman.

Chairman Boehlert, Representative Gordon, and distinguished Committee Members and staff, I appreciate the opportunity to discuss with you this morning the status of the way ahead for the National Polar-orbiting Operational Environmental Satellite System, commonly known as NPOESS. And I thank the Committee for its continuing interest and strong support for NOAA's satellite programs.

NOAA's satellites provide an unparalleled capability to take images and precise measurements of the land, sea, and air. Data from these observing systems are essential to our ability to understand and predict changes in the Earth's environment and to conserve and manage coastal and marine resources.

Specifically, NOAA's polar satellites provide global images and atmospheric measurements and are the foundation of our global weather models. These models are critical to our mid- and long-range forecasts. The information from these satellites has many other applications, including climate and ocean research as well as disaster monitoring.

Although their payoff is great, these satellites are also an inherently risky endeavor. Unlike a lot of things in our life, this is rocket science. These instruments must be sensitive enough to measure very small differences in the composition of the oceans and atmosphere while being able to withstand extreme vibrations of a launch and the extreme heating and cooling of the space environment.

In 1994 regarding NPOESS, after a thorough review and serious consideration, President Clinton directed the merger of the military and civilian polar satellite programs. This new program, NPOESS, is responsible for developing the next generation of polar satellites and sensors. The program was designed as a series of six satellites and with a total instrument load of 13, including 10 environmental sensors, five of which represent significant advances over current technology.

The new NPOESS sensors will provide higher quality data leading to more sophisticated environmental models for weather, climate, and the oceans.

The program also includes a risk reduction component, the NPOESS Preparatory Project called NPP. NPP was designed to test several of the new sensors in space and to ensure the ground control systems work properly and allow us time to simulate the new data into the computer weather models before launch of the first operational NPOESS satellite.

In terms of NPOESS management, NPOESS is a unique program in the Federal Government. It is jointly managed by the Department of Commerce and the Department of Defense, and the National Aeronautics and Space Administration, with direct funding provided by the Department of Commerce and the Department of Defense. At the senior level, the program is overseen by the Executive Committee, or EXCOM. This group meets several times a year to review the program, approve budgets, policies, and ensure agency funding commitments are equitable and sustained.

The Integrated Program Office, or IPO, as it is called, is responsible for managing all aspects of the program. The system is being acquired using DOD acquisition authorities and is managed by the IPO. In 2002, Northrop Grumman was selected as the NPOESS prime contractor for spacecraft development, ground systems, sensor integration, and operations.

Regarding the status of NPOESS, it is, as I have said, one of the most complex environmental satellite programs ever developed or proposed. This program represents numerous technical, developmental, integration, and management challenges. Overall progress has been made. The ground system is on budget and schedule despite some early technical challenges typical for complex developmental efforts. Major problems have been resolved for most of the sensors. The one sensor causing most of the recent problems is the Visible/Infrared Imager Radiometer Suite, called VIIRS.

VIIRS is the key imaging sensor delivering most of the atmospheric cloud and surface information products needed by weather forecasters. The IPO became aware of significant problems in mid- to late 2004. At the time, we believed the cost and schedule delays would only impact the NPP satellite, not the NPOESS satellites.

On March 31, 2005, however, the contractor provided information to the IPO stating that it would not meet NPOESS cost and schedule plans due to problems with VIIRS as well as cost overruns in other parts of the program. The company provided this information in a formal letter on May 19, 2005.

Since May 19, additional reviews and cost estimates led the Administration to notify Congress in September that the cost was

likely to rise at least 15 percent per the notification in the Nunn-McCurdy Act.

What we have done since then, as I have said many times, these problems are serious. We consider them seriously. We are doing everything we can to resolve the technical challenges that we have and to improve the management of the program and to get the program back on the right track, as you discussed in your opening statements. Significant changes have been made. The IPO System Program Director has resigned, and the government is searching for a new program manager. Northrop Grumman has hired a new NPOESS Program Manager and Raytheon, the subcontractor for VIIRS, has brought in a whole new sensor management team.

In addition, the EXCOM has initiated two independent reviews of the program in the past six months. One looked at the problems with VIIRS impacting NPP, and the other, the Independent Program Assessment, called IPA, has examined the overall NPOESS program. These review teams are helping us to understand what happened and how to move forward. We are exploring many options, such as reducing sensor requirements, limiting the number of satellites, and shifts in cost and schedule. At the same time, the EXCOM is working with our user group to understand how any changes would impact the users of the data.

In addition to the independent programmatic reviews, the EXCOM has asked the DOD's Cost Analysis and Improvement Group, or CAIG, to look at the cost and schedule estimates. This group is made up of acquisition and technical experts who can help provide further confidence in the cost estimates being discussed for the program.

Of the questions the Committee asked me to answer: "What is the current estimate of the cost and launch date for the first NPOESS satellite?"

In short, since 2003, our plan was to launch NPP in October of 2006 and the first NPOESS satellite in November of 2009. Based on the issues discussed earlier, we now expect that timeline to be extended by at least two years, subject to the ongoing reviews.

We anticipate a cost increase of at least 15 percent. The EXCOM will evaluate alternatives based on information from the IPA and the CAIG in December. Following the EXCOM decision, the IPO will begin the process to modify the contract with the target to complete the modification by September 2006.

On the question regarding why we are not considering options that will increase spending in fiscal year 2006 and 2007, we have considered many options, including those that include additional funding in fiscal year 2006 and fiscal year 2007. The last information that we have had from our IPA team, however, concluded that to significantly improve our competency and success of the program, more time must be provided in between ongoing development and testing activities. The stretching of that schedule means that additional funding in fiscal year 2006 or fiscal year 2007 would not be warranted or be used beneficially. So stretching the schedule reduces the risk while increasing our chances of success.

Would there be a gap in polar satellite data? What are the implications? If the last of NOAA's current POES satellite fails before the first flight of NPOESS, there could be a gap for much of the

polar data. We are examining delaying the launch of the last POES satellite and using any of the remaining DOD polar satellites. We are also looking at NPP and the capabilities of the European polar satellites to cover any potential gaps. Should all of these efforts fail, and there is a number of significant back-ups here, we will experience degradation to our global weather models, which could impact our ability to forecast long-range weather.

In conclusion, NPOESS is a very complex acquisition program. We are working very hard to overcome the technical and management challenges that have occurred. But before we make continuing major decisions, we need to ensure we have the best and the most complete information possible. We expect to have that information from ongoing independent reviews in the next two months and will be able to make some longer-range decisions on how to proceed.

Thank you very much for the opportunity to discuss this with you today, and I am prepared to answer your questions.

Thank you, sir.

[The prepared statement of Vice Admiral Lautenbacher follows:]

PREPARED STATEMENT OF VICE ADMIRAL CONRAD C. LAUTENBACHER, JR.

Chairman Boehlert, Representative Gordon, and Committee Members, I appreciate the opportunity to discuss with you the National Polar-orbiting Operational Environmental Satellite System (NPOESS). I am Conrad C. Lautenbacher, Jr., Under Secretary for Oceans and Atmosphere and Administrator of the National Oceanic and Atmospheric Administration (NOAA) in the Department of Commerce (DOC).

NOAA's Satellite Programs

Satellites provide an unparalleled capability to take images and precise measurements of many aspects of vast areas of the land, sea and air in very rapid succession. Data obtained from these observing systems are essential to our ability to understand and predict changes in the Earth's environment, and to conserve and manage coastal and marine resources. They are a key enabler to NOAA meeting its public safety, economic and environmental mission requirements.

NOAA currently operates two major satellite programs. The Geostationary Operational Environmental Satellite (GOES) program provides continuous imaging and sounding data of the Western Hemisphere. This data is critical to our short-range weather forecasts and increases our ability to observe extreme weather events, such as tropical storms and tornadoes. The Polar-orbiting Operational Environmental Satellite (POES) program provides global images and atmospheric measurements a few times a day. This data is the foundation for our global weather models, which are critical to our mid- to long-range forecasts. POES satellites also contain components which receive and relay signals from search and rescue beacons to emergency officials. Information from both programs has many other applications, such as climate and ocean research, disaster monitoring, and global vegetation analysis.

What is NPOESS

Since the early 1960s, the United States has maintained two polar satellite programs, one for military use and one for civilian use. While data from both programs was freely exchanged, each satellite program operated independently. In 1994, after a multi-year review concluded that civilian and military requirements could be satisfied by a single polar satellite program, President Clinton directed the merger of the two programs into one—NPOESS. The program was designed as a series of six satellites, with a maximum of three operating at any given time (one in an early, mid morning and early afternoon orbit). Under the NPOESS program 14 different sensors are being developed that will be distributed in various configurations depending on the satellite's designated orbit. Several of these sensors represent significant advances over current technology.

The new NPOESS sensors will provide higher quality data, increase our ability to see through clouds, and beam the information back more often than current polar satellites. These improvements will translate into more sophisticated weather models, which will lead to better forecasts and warnings. Satellites provide over 90 per-

cent of the data used in weather forecasting models. NPOESS also will enhance the data and products used for climate and ocean research and operations as well as monitoring space weather.

The program also includes a risk reduction component—the NPOESS Preparatory Project (NPP). NPP was designed to test several of the new sensors in space and to ensure the ground control systems work properly before launch of the first operational NPOESS satellite. Additionally, NPP should also allow us time to assimilate the new data sets into the computer weather models and other applications before NOAA would need to use them operationally. Finally, NPP should ensure continuity of certain climate records as some of the satellites maintained by the National Aeronautics and Space Administration (NASA) reach their end of life. As designed, the NPOESS program should provide the sensors to NASA, who would acquire and build the NPP spacecraft.

How is NPOESS Managed

Per a Presidential Decision Directive and the resultant DOC/DOD/NASA Memorandum of Agreement, the program is managed jointly by DOC, DOD, and NASA, with direct funding provided by DOC and DOD. At the senior level, the program is overseen by an Executive Committee (EXCOM), on which I represent the Department of Commerce, Dr. Sega represents the Department of Defense, and Dr. Griffin represents NASA. This group meets several times a year to review progress in achieving cost, schedule and performance baselines. The EXCOM also approves program plans, budgets, and policies, and ensures agency funding commitments are equitable and sustained.

To assist the EXCOM, a Tri-Agency Steering Committee consisting of individuals from the same agencies meets monthly. This group acts on our behalf as a senior level management review body and recommends actions to the EXCOM, and provides guidance to the Integrated Program Office (IPO). A Senior User Advisory Group (SUAG), comprised of primary United States Government users, operates independently of the IPO and reviews, adjudicates and recommends NPOESS requirements for agency validation and subsequent Joint Agency Requirements Council (JARC) approval.

The IPO, under the direction of a System Program Director, is responsible for the planning, budgeting, development, acquisition, launch operation and management of the NPOESS program. The system is being acquired using DOD acquisition authorities and the Air Force contract is managed by the IPO. In 2002, Northrop Grumman was selected as the NPOESS prime contractor for spacecraft development, ground systems, sensor integration, and operations. Contracts for some sensors were awarded before the prime contract.

What is the Status of NPOESS

NPOESS likely is the most complex environmental satellite program ever developed. The NPOESS program presents numerous technical, developmental, integration and management challenges.

The ground system is on budget and on schedule. For the spacecraft, technical challenges have occurred in several of the sensor development efforts. The two sensors that have experienced the most serious development and manufacturing problems are the Conical Microwave Imager/Sounder (CMIS) and the Visible/Infrared Imager Radiometer Suite (VIIRS).

CMIS provides all-weather sounding and imaging capability, i.e., the ability to see through the clouds. While work continues on CMIS, it is still in its initial design phase. Early problems included meeting design performance within weight constraints. We believe these technical issues are being resolved. Furthermore, we are incorporating the lessons learned from the VIIRS experience to our management approach to CMIS.

VIIRS provides the information used in many of the critical environmental data records and is the key imaging sensor delivering most of the atmospheric cloud and surface information products needed by weather forecasters. In mid-2004 during initial testing phases, we encountered significant problems showing potential design deficiencies and manufacturing process shortfalls. In late 2004, a cooling unit on the sensor, which is critical to its operation, failed during testing. These problems prompted a complete review of the sensor design, development and management. At the time, we believed the cost and schedule delays would be limited to NPP.

On March 31, 2005, however, Northrop Grumman communicated to the IPO that it would not be able to meet overall NPOESS cost and schedule baselines due to the problems encountered with development of VIIRS. Northrop Grumman formally notified the Government by letter on May 19, 2005.

Reviews and preliminary cost estimates led the Administration in September to conclude that there was a reasonable expectation that the cost to produce each satellite unit was likely to rise at least 15 percent per the notification requirement in the Nunn-McCurdy amendment.

What the Government has Done

The problems facing NPOESS are serious and we are working to contain cost growth, limit schedule delays, and reduce risk. Significant changes have been made in the overall management of the NPOESS program to improve the effectiveness of both government and contractor oversight. The Government is engaged in a search for a new NPOESS Program Director, as the System Program Director resigned in September. Since the VIIRS problems were discovered, the IPO has had an on-site presence at the contractor's facilities and at Raytheon (the subcontractor for VIIRS), and is more involved in the day-to-day work being conducted. In terms of personnel, Northrop Grumman has assigned a new NPOESS Program Manager and Raytheon has brought in a new senior sensor management team. In addition, the EXCOM has initiated two independent reviews of the program, one to look at the problems of VIIRS impacting NPP and another—the Independent Program Assessment (IPA)—to examine the overall NPOESS program. These review teams are helping us to better understand what has gone wrong with the program and more fully explore the various options for moving forward. The review teams are exploring reducing sensor requirements and relying on other satellite systems to provide some of the requirements. At the same time, the EXCOM is working with the SUAG to understand how any changes to capabilities would impact users.

In addition to the independent programmatic reviews, the EXCOM has asked the DOD's Cost Analysis and Improvement Group (CAIG) to provide an independent analysis of several IPA cost and schedule estimates. This group is made up of acquisition and technical experts who can help provide further confidence in the cost estimates being discussed for both the current NPOESS program and other options.

Response to Specific Questions

I would now like to respond specifically to the questions the Committee presented me in its invitation letter.

1. What is the current estimate of the cost and launch date for the first NPOESS satellite and how does that compare to the September 2003 baseline ($7.3 billion and November 2009)? What steps need to be taken to firm up the cost and schedule estimate and when will an official new baseline be available?

In 2003 and 2004, our plan was to launch NPP in October 2006, and the first NPOESS satellite in November 2009. Based on the problems discussed earlier, we expect the availability dates for NPP and the NPOESS satellites to be extended at least two years. These launch dates may be shortened or extended based on ongoing reviews of these issues and EXCOM decisions.

We anticipate a cost increase of at least 15 percent per unit, which triggered the Nunn-McCurdy notification. The EXCOM will evaluate alternatives based on information from the IPA and CAIG in December. Following EXCOM direction, the IPO will begin the process to modify the contract with the target to complete the modification by September 2006. This will culminate in an updated baseline in November 2006.

2. What program options are being considered in response to the increased cost and schedule delays? Do any of these options involve scaling back the capability of the NPOESS satellite? Would such scaling back affect the plans of other agencies to fly sensors on NPOESS?

We have reviewed numerous program options. These options include all three elements of cost, schedule and performance. For example, we considered maintaining the current budget and delaying the launches, or increasing the budget in the early years to minimize launch delays. We also looked at options that used NPOESS in only two orbits. Finally, we also looked at scaling back or deleting capability from the NPOESS satellites to reduce program cost and minimize launch delays. If we scale back the spacecraft, it could limit the size and number of total sensors flown on NPOESS.

3. It is our understanding that no options are being considered that increase spending in Fiscal Year (FY) 2006 or FY 2007. Why is that the case? Will delaying action until FY 2008 increase the lifetime cost of the NPOESS program and increase the risk that the satellite will not be ready in time to perform its mission? Is the decision to not increase

spending driven purely by near-term Federal budget constraints? If so, why is NOAA assuming that funding will be more available in FY 2008?

We considered all options, including those with additional FY 2006 and FY 2007 funding. However, the IPA has concluded that additional funding in these years would not buy back any schedule delays. All options will increase the lifetime cost of the NPOESS program. Decisions were not driven by near-term budget impacts, but rather have been focused on delivering the best possible overall value for the Nation.

4. If the last satellite from the current NOAA polar series fails during launch or in orbit, then, given the schedule delays anticipated for NPOESS, there could be a 19- to 36-month gap in polar satellite coverage for NOAA. If a coverage gap were to occur, what are the implications for NOAA weather forecasting capabilities? What are NOAA's contingency plans for a gap in polar satellite coverage?

We are considering options including the delay of the launch of the last POES satellite to improve the likelihood of overlap between POES and NPOESS satellites. If the last POES fails between launch and before the first flight of NPOESS, there could be a gap for some of the polar data. NOAA is working with DOD and our European partners to determine what fall-back capabilities are available. We are also examining how to use NPP to cover any potential gaps. Should all these efforts fail, we could experience some degradation to our global weather models.

Conclusion

NPOESS is a very complex acquisition program that will greatly enhance and increase our nation's capabilities in weather forecasting and in other important environmental research areas. We are working very hard to overcome the technical and management challenges that have occurred and we believe that viable options to rationalize the program and move forward exist. Before we make any major decisions, however, we want to ensure we have the best information possible. We expect to have the information from the ongoing independent reviews in the next two months and will then be able to make some final decisions.

Thank you for the opportunity to speak with you today and I am prepared to answer any questions you have.

BIOGRAPHY FOR VICE ADMIRAL CONRAD C. LAUTENBACHER, JR.

A native of Philadelphia, Pa., retired Navy Vice Admiral Conrad C. Lautenbacher, Ph.D., is serving as the Under Secretary of Commerce for Oceans and Atmosphere. He was appointed Dec. 19, 2001. Along with this title comes the added distinction of serving as the eighth Administrator of the National Oceanic and Atmospheric Administration. He holds an M.S. and Ph.D. from Harvard University in applied mathematics.

Lautenbacher oversees the day-to-day functions of NOAA, as well as laying out its strategic and operational future. The agency manages an annual budget of $4 billion. The agency includes, and is comprised of, the National Environmental Satellite, Data and Information Services; National Marine Fisheries Service; National Ocean Service; National Weather Service; Oceanic and Atmospheric Research; Marine and Aviation Operations; and the NOAA Corps, the Nation's seventh uniformed service. He directed an extensive review and reorganization of the NOAA corporate structure to meet the environmental challenges of the 21st century.

As the NOAA Administrator, Lautenbacher spearheaded the first-ever Earth Observation Summit, which hosted ministerial-level representation from several dozen of the world's nations in Washington July 2003. Through subsequent international summits and working groups, he worked to encourage world scientific and policy leaders to work toward a common goal of building a sustained Global Earth Observation System of Systems (GEOSS) that would collect and disseminate data, information and models to stakeholders and decision-makers for the benefit of all nations individually and the world community collectively. The effort culminated in an agreement for a 10-year implementation plan for GEOSS reached by the 55-member countries of the Group on Earth Observations at the Third Observation Summit held in Brussels February 2005.

He also has headed numerous delegations at international governmental summits and conferences around the world, including the U.S. delegation to 2002 Asia-Pacific Economic Cooperation Ocean Ministerial Meeting in Korea, and 2002 and 2003 meetings of the World Meteorological Organization and Intergovernmental Oceano-

graphic Commission in Switzerland and France, as well as leading the Commerce delegation to the 2002 World Summit on Sustainable Development in South Africa.

Before joining NOAA, Lautenbacher formed his own management consultant business, and worked principally for Technology, Strategies & Alliances Inc. He was president and CEO of the Consortium for Oceanographic Research and Education (CORE). This not-for-profit organization has a membership of 76 institutions of higher learning and a mission to increase basic knowledge and public support across the spectrum of ocean sciences.

Lautenbacher is a graduate of the U.S. Naval Academy (Class of 1964), and has won accolades for his performance in a broad range of operational, command and staff positions both ashore and afloat. He retired after 40 years of service in the Navy. His military career was marked by skilled fiscal management and significant improvements in operations through performance-based evaluations of processes.

During his time in the Navy, he was selected as a Federal Executive Fellow and served at the Brookings Institution. He served as a guest lecturer on numerous occasions at the Naval War College, the Army War College, the Air War College, The Fletcher School of Diplomacy, and the components of the National Defense University.

His Navy experience includes tours as Commanding Officer of USS HEWITT (DD–966), Commander Naval Station Norfolk; Commander of Cruiser-Destroyer Group Five with additional duties as Commander U.S. Naval Forces Central Command Riyadh during Operations Desert Shield and Desert Storm, where he was in charge of Navy planning and participation in the air campaign. As Commander U.S. Third Fleet, he introduced joint training to the Pacific with the initiation of the first West Coast Joint Task Force Training Exercises (JTFEXs).

A leader in the introduction of cutting-edge information technology, he pioneered the use of information technology to mount large-scale operations using sea-based command and control. As Assistant for Strategy with the Chief of Naval Operations Executive Panel, and Program Planning Branch Head in the Navy Program Planning Directorate, he continued to hone his analytic skills resulting in designation as a specialist both in Operations Analysis and Financial Management. During his final tour of duty, he served as Deputy Chief of Naval Operations (Resources, Warfare Requirements and Assessments) in charge of Navy programs and budget.

Lautenbacher lives in Northern Virginia with his wife Susan who is a life-long high school and middle school science teacher.

Chairman BOEHLERT. Thank you very much.

In your testimony, I observe that there are a number of new players on your team. I hope we are not using the same playbook.

Here is a new player on the team, Dr. Sega.

Dr. Ronald M. Sega, Under Secretary for the Air Force, has a very distinguished career in government in a variety of important capacities. Dr. Sega, we are pleased to welcome you in this new capacity.

STATEMENT OF DR. RONALD M. SEGA, UNDER SECRETARY FOR THE AIR FORCE

Dr. SEGA. Thank you.

Mr. Chairman, Congressman Gordon, and distinguished Members of the Committee, I am honored to appear before you today to discuss——

Chairman BOEHLERT. Dr. Sega, would you make sure your mike is on.

Dr. SEGA. Okay. Let us try that again here. Okay. Thank you.

Mr. Chairman, Congressman Gordon, and distinguished Members of the Committee, I am honored to appear before you today to discuss the status of the National Polar-orbiting Operational Environmental Satellite System, NPOESS.

Mr. Chairman, I request that my written statement be entered into the record.

Chairman BOEHLERT. Without objection, so ordered.

All of the statements will be included in the record in their entirety, and we would appreciate your willingness to kind of abbreviate so we can get to the important dialogue.

Dr. SEGA. Thank you, sir.

In my role of overseeing the Department of Defense space activities as Under Secretary of the Air Force and the DOD Executive Agent for Space, I am committed to preserving the space capabilities that our commanders and forces depend on to conduct their missions.

Shortly after I was sworn in as Under Secretary of the Air Force this August, I met with the NPOESS Executive Committee, the EXCOM. We were briefed that program cost growth would likely exceed the Nunn-McCurdy statutory limits, so we directed that Congress be notified and chartered an Independent Program Assessment, IPA, team to examine management, budget, and technical issues.

Also, in light of the system program director's impending departure, we selected Brigadier General Select Sue Mashiko, one of our most experienced program managers. And Sue Mashiko is behind us here. She led the Atlas booster program as the program manager and EELVs department. The Nation has now its longest successful launch streak of 43 in a row successful national security satellite launches, in part due to Brigadier General Select Mashiko. She agreed to take over at this position as an interim program manager though her some of her household things have already been transferred to her new job in Florida and Eglin Air Force Base as Vice Commander.

We also requested that the Office of the Secretary of Defense Cost Analysis Improvement Group complete an independent cost estimate of the NPOESS program of record. All of these actions, including the Nunn-McCurdy notification to Congress on September 28, 2005 were coordinated between the EXCOM members.

The EXCOM next met in October. We were briefed on preliminary results of the independent assessment and decided to cap the program expenditures within the fiscal year 2006 limits as the assessment team, the IPA, and the cost estimators, the CAIG, continued their work.

In order to reduce the technical risk of a key sensor, the Visible/Infrared Imager Radiometer Suite, VIIRS, the EXCOM also decided to change the VIIRS' development approach from concurrent development where the engineering and flight units were built at the same time, to a serial development. We are delivering the engineering unit first and then following with the flight unit. And to reduce the risk of the science coverage gap, the EXCOM decided that NASA should launch the NPOESS Preparatory Project, NPP, satellite into an afternoon orbit.

The IPA is still looking at several options, and will deliver its report to the EXCOM on November 22. The CAIG is also scheduled to present their independent cost estimate of the baseline program at that time. The EXCOM will review these results and determine the way ahead.

The actions taken by the EXCOM reflect their determination to reduce the technical and management risk and programmatic risk to NPOESS. This effort reflects a much larger effort to structure

space acquisition programs within what I see as four distinct but interrelated acquisition phases: operational system procurement, systems development, advanced technology development, and science and technology.

This restructuring of acquisition is designed to redistribute the risk. Decreased risk in the operational procurement phase, that is, increase the technology maturity and reducing the risk in production and fielding of operational systems and increase the risk in the advanced technology development and science and technology phases.

Operational systems like NPOESS are critical for our nation. Gaps in polar coverage will impact field commanders, situational awareness, and operational mission planning, effect low-Earth orbit space environment monitoring, which is crucial for precision navigation, communications, and missile defense operations, and degrade the severe weather forecast that help protect both military and civilian property. Polar-orbiting satellites such as NPOESS are necessary to meet DOD weather forecasting and national security objectives.

Mr. Chairman, I appreciate the continued support of the Congress, this committee, and the House Armed Services Committee to deliver vital capabilities to our war fighters and ensure we have the space capabilities we need.

Thank you for the opportunity to appear before this committee today. I look forward to your questions.

[The prepared statement of Dr. Sega follows:]

PREPARED STATEMENT OF RONALD M. SEGA

INTRODUCTION

Mr. Chairman and Members of the Committee, I am honored to appear before you today to address the state of the National Polar-Orbiting Operational Environmental Satellite System (NPOESS). In my role of overseeing Department of Defense (DOD) space activities as Under Secretary of the Air Force and the Department of Defense (DOD) Executive Agent for Space, I am committed to preserving the space capabilities that our commanders and forces depend on to conduct their missions.

NPOESS STATUS

The NPOESS Integrated Program Office (IPO), made up of DOD, Department of Commerce (DOC), and National Aeronautics and Space Administration (NASA) personnel, was formed in December 1994, in response to the President's direction to converge the DOD and DOC polar weather satellite systems: the Defense Meteorological Satellite Program (DMSP) and the Polar Orbiting Environmental Satellite (POES), respectively.

Since that time, the program has experienced several development challenges, culminating in the Nunn-McCurdy notification to Congress on September 28, 2005. We notified Congress that the NPOESS cost has grown at least 15 percent. Currently, the OSD Program Assessment & Evaluation Cost Analysis Improvement Group is independently assessing the NPOESS program cost and expects to complete their work in December 2005. We will provide the results of their effort to this committee when it becomes available. As we address the issues with the program and the risks of completing the acquisition, we acknowledge the possibility that the cost estimates may grow even higher. Hand-in-hand with the cost growth, the launch date has slipped; we anticipate the first NPOESS launch no earlier than fiscal year 2012.

The NPOESS Executive Committee (EXCOM) chartered an Independent Program Assessment (IPA) team to support the establishment of a clear and unambiguous program baseline and cost estimate. In addition to an in-depth analysis of the current program, the IPA is currently exploring several options for a re-structured NPOESS program; however, these are preliminary and further evaluation is needed.

We expect the EXCOM to direct a program re-plan based on the IPA recommendations while taking user requirements into consideration through the Senior Users Advisory Group (SUAG), a Flag Officer/SES-level group from nine organi-

zations within NOAA, the Air Force, NASA, the Joint Staff, the Navy, and the National Weather Service. For the re-plan, the IPO will build a detailed cost and schedule estimate in early calendar year 2006, prepare a new Acquisition Program Baseline, and update the Selected Acquisition Report. Once the new estimates are complete, the DOC and DOD will implement the new program baseline through each agency's funding processes.

One of the IPA's preliminary findings is that too much work has been deferred to maintain the current program schedule. Even if additional FY06/07 funding were provided, the program could not maintain the current schedule because development of various sensors requires more time for integration and testing in order to reduce overall mission risk.

AVOIDING COVERAGE GAPS

Building and launching NPOESS is critical for our nation's weather forecasting capabilities. Currently, polar orbiting platforms provide over 90 percent of the data used in DOC and DOD prediction models. A gap in polar coverage will impact commanders' situational awareness and operational mission planning. These satellites also provide low-Earth orbit space environment monitoring which is needed for effective precision navigation, communications and missile defense operations, and the operation of all orbiting spacecraft.

Polar-orbiting meteorological spacecraft also help with protecting both military and civilian property. For example, if polar-orbiting microwave imagers or infrared sounders are not available, hurricane forecasts will be degraded.

If we encounter or anticipate a significant gap in polar satellite coverage, we would potentially employ several overhead platforms—spaceborne and airborne—to provide weather data. For instance, we may partner with NASA to use data from their research satellites in Air Force weather models. In addition, the Air Force is currently evaluating the usefulness of the high altitude flight regime using long-duration missions in the upper atmosphere for persistent coverage of mission areas not visible to geostationary satellites. Finally, one way we may minimize a gap in coverage is through a DMSP Service Life Extension Program aimed at increasing the lifespan of critical components.

CONCLUSION

NPOESS is important to the future of DOD weather forecasting. The Air Force is responsible for weather forecasting for global military operations to include in areas where data is unavailable or denied. Presently, DMSP is a key assured source of data to accomplish that mission. Geostationary satellite data is of lower spatial resolution and cannot cover latitudes higher than 67 degrees—yet high latitude conditions are major drivers of worldwide weather. Polar-orbiting satellites such as NPOESS, as the eventual replacement for DMSP, are necessary to support national security objectives.

I appreciate the continued support of the Congress and this committee to deliver vital capabilities to our warfighters and ensure we have the forecasting and remote sensing capabilities we need.

BIOGRAPHY FOR RONALD M. SEGA

Dr. Ronald M. Sega is Under Secretary of the Air Force, Washington, D.C. Dr. Sega is responsible for all actions of the Air Force on behalf of the Secretary of the Air Force and is acting Secretary in the Secretary's absence. In that capacity, he oversees the recruiting, training and equipping of more than 710,000 people, and a budget of approximately $110 billion. Designated the Department of Defense Executive Agent for Space, Dr. Sega develops, coordinates and integrates plans and programs for space systems and the acquisition of all DOD space major defense acquisition programs.

Dr. Sega has had an extensive career in government service, academia and research. He graduated from the U.S. Air Force Academy in 1974 as a distinguished graduate. His active-duty assignments included instructor pilot and Department of Physics faculty member at the U.S. Air Force Academy. He entered the Air Force Reserve in 1982 with the 901st Tactical Airlift Group at Peterson Air Force Base, Colo., serving in a variety of operations positions. From 1987 to 2001 he served at Air Force Space Command in several assignments, including Mission Ready Crew Commander for satellite operations for the Global Positioning System, Defense Support Program and Midcourse Space Experiment. A command pilot with more than 4,000 flying hours, he retired from the Air Force Reserve in 2005 as a major general, last serving as the reserve assistant to the Chairman of the Joint Chiefs of Staff.

Dr. Sega joined NASA as an astronaut in 1990, making his first Shuttle flight in 1994 aboard the Space Shuttle Discovery. From November 1994 to March 1995, he was NASA's Director of Operations, Russia, responsible for managing NASA activities supporting astronaut and cosmonaut training for flight on the Russian Mir Space Station. He completed his second Shuttle flight in 1996 as payload commander for the third Shuttle/Mir docking mission aboard Atlantis, completing his astronaut tenure with 420 hours in space.

Since 1982, Dr. Sega has been a faculty member in the Department of Electrical and Computer Engineering at the University of Colorado at Colorado Springs with a rank of Professor since 1990. In addition to teaching and research activities, he was Technical Director of the Laser and Aerospace Mechanics Directorate at the U.S. Air Force Academy's F.J. Seiler Research Laboratory, and Assistant Director of the Space Vacuum Epitaxy Center, including management of the Wake Shield Facility Flight Programs at the University of Houston. Dr. Sega was the Dean of the College of Engineering and Applied Science at the University of Colorado from 1996 to 2001. In August 2001, he was appointed as the Director of Defense Research and Engineering, Office of the Secretary of Defense, serving as Chief Technical Officer for the Department and the Chief Advisor to the Secretary of Defense and Under Secretary of Defense for Acquisition, Technology and Logistics for scientific and technical matters. Dr. Sega has authored or co-authored more than 100 technical publications, has served on numerous local, regional and national advisory and governance boards, and he is a Fellow of the American Institute of Aeronautics and Astronautics and the Institute of Electrical and Electronics Engineers.

EDUCATION

1974 Distinguished graduate, Bachelor of Science degree in math and physics, U.S. Air Force Academy, Colorado Springs, Colo.

1975 Master of Science degree in physics, Ohio State University, Columbus

1982 Doctor of Philosophy in electrical engineering, University of Colorado

CAREER CHRONOLOGY

1974–1982, U.S. Air Force pilot, instructor pilot, and Physics Department faculty member (U.S. Air Force Academy, Colorado Springs, Colo.)

1982–1985, Assistant Professor, Department of Electrical and Computer Engineering, University of Colorado at Colorado Springs

1985–1990, Associate Professor, Department of Electrical and Computer Engineering, University of Colorado at Colorado Springs (1987–1988, Technical Director, Lasers and Aerospace Mechanics Directorate, Frank J. Seiler Research Laboratory, U.S. Air Force Academy, Colorado Springs, Colo.; 1989–1990, Assistant Director for Flight Programs, Space Vacuum Epitaxy Center, Associate Research Professor in Physics, University of Houston, Texas)

1990–1991, Astronaut candidate, NASA, Lyndon B. Johnson Space Center, Houston, Texas

1991–1996, Astronaut, NASA, Lyndon B. Johnson Space Center, Houston, Texas (1990–1996, Adjunct Professor of Physics, University of Houston, Texas)

1996–2001, Dean, College of Engineering and Applied Science, University of Colorado at Colorado Springs

2001, acting Assistant to the Secretary of Defense for Nuclear, Chemical and Biological Programs, Office of the Secretary of Defense, the Pentagon, Washington, D.C.

2001–2005, Director of Defense Research and Engineering, Office of the Secretary of Defense, the Pentagon, Washington, D.C.

1982–2005, U.S. Air Force Reserve officer, pilot (302nd Tactical Airlift Wing), space operator (Air Force Space Command), and reserve assistant to the Chairman of the Joint Chiefs of Staff

2005–present, Under Secretary of the Air Force, Washington, D.C.

Chairman BOEHLERT. Thank you very much, Dr. Sega.

Dr. Livanos. And you know, it is not often that, on Capitol Hill, the contractors are thrown into a cage. Usually contractors are a favorite subject for criticism, but your team has been particularly forthcoming in responding to our information inquiries, and we have had complete dialogue, and I appreciate that very much. This

is very helpful to all of us as we conduct this very important business.

The Chair now recognizes you for your opening statement.

STATEMENT OF DR. ALEXIS C. LIVANOS, PRESIDENT, NORTHROP GRUMMAN SPACE TECHNOLOGY

Dr. LIVANOS. Chairman Boehlert, Ranking Member Gordon, and distinguished Members of the Committee, I appreciate the opportunity to discuss with you the status of the NPOESS program today.

Northrop Grumman serves as prime contractors of NPOESS. We were awarded that contract in August of 2002.

I am here today to convey my personal commitment, and the commitment of my company, to this program. We are employing extensive resources to this effort and are committed to mission success, a concept that we have employed consistently over the last 20 years.

We accept the responsibility for problems in the program, and we stand accountable to our customers and to you to move the program forward in the most cost-effective manner possible.

NPOESS will revolutionize weather forecasting and military planning far surpassing our current capabilities. Observation delivery time of just 15 minutes compared to the hours needed today with the ability to measure ocean waves, see sand storms, for example. NPOESS will play a big role in providing more precise advanced warning of hurricanes and other adverse weather, and very importantly, empower our armed forces with real-time environmental information essential for their mission success and personal safety.

As prime, we are responsible for overall system design, integration, and performance of the system. We are supported by a diverse team of contractors. In fact, more than 70 percent of the program is subcontracted. We have 1,700 people working on the program in 15 states.

And NPOESS has achieved success in many fronts. The ground data processing segment, the terrestrial communications network, and the spacecraft design are moving smoothly through development, as are 10 out of the 13 sensors. But we have got our problems and cost overruns associated with the development of some sensor suites. We have conducted extensive tests of these new suites and instruments and believe we now know what it will take to make them function properly.

When invited to appear before this committee, I was asked four specific questions, and I am prepared to address them now.

First you asked for an estimate of the cost and the launch date for the first NPOESS satellite.

Earlier this year, at the request of our customer, we developed and submitted more than 30 scenarios on how to proceed. The exact program cost and launch readiness dates will be determined by the decision by the Integrated Program Office. We anticipate receiving direction from the IPO in early 2006. At that time, we will immediately begin development of a revised program.

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[Slide.]

Depending on the option selected, launch delays for the first few satellites could range from months to years with cost increases of $1 billion or more.

Your second question asked what Northrop Grumman has implemented in its oversight of subcontractors.

More than 80 percent of the NPOESS cost growth and delay is attributable to sensor development by subcontractors. Northrop Grumman is working aggressively to resolve the issues at the subcontractor level and has taken many steps to correct any systemic process issues we have discovered. Specifically, we have expanded and strengthened the expertise of our on-site and support subcontract management. We have appointed a new team, an NPOESS vice president program director and spacecraft director who are seasoned professionals with experience in the execution phase of the program. We have instituted the practice of conducting deep dives into subcontractor design and development activity at the first sight of problems using our expertise and resources. We have co-located Northrop Grumman engineers and managers at subcontractor facilities to help solve problems. We have made the vice President of subcontracts a direct report to me to increase oversight. And we have a commitment at the CEO level from both Northrop Grumman and the subcontractors' top executives to assure performance because of the importance of this program.

The third question is whether we made recommendations to the government on a path forward and what those options are.

As I said earlier, we have spent many months studying alternatives and submitted more than 30 options to the IPO and, more recently, to the Independent Program Assessment Team.

We have used three criteria to develop the scenarios: fit within specified funding limits, minimize the life cycle costs, and meet mission objectives. The options we recommended involved trading increases in program schedule for decreases in near-term funding. They also address reductions in scope, such as canceling a satellite or eliminating instruments. The range of options is extensive, and we believe we have carefully considered every possibility.

As part of studying alternatives, we have concluded that additional funds would allow us to shorten the development schedule, reduce cost, reduce risk, and assure continuity in weather coverage, which is my response to your fourth question. This would enable continued acceleration of the development schedule for sensors and the risk reduction at large.

Mr. Chairman, we stand behind the NPOESS program. We are ready to execute the chosen approach. We have and we will commit whatever it takes to make it happen.

[The prepared statement of Dr. Livanos follows:]

PREPARED STATEMENT OF ALEXIS C. LIVANOS

Introduction

Chairman Boehlert, Ranking Member Gordon and distinguished Members of the Committee. I am Alexis Livanos, president of Northrop Grumman Space Technology and vice president of Northrop Grumman Corporation. I appreciate the opportunity to discuss the status of the National Polar-orbiting Operational Environmental Satellite System (NPOESS) with you today.

As the Nation's next-generation environmental data system, NPOESS will provide global, 24/7 environmental monitoring, surpassing any existing capabilities. The NPOESS system of low-Earth orbiting satellites, ground data processing networks, and a terrestrial communication network will play a pivotal role in weather preparedness in civil, military and science missions for the next 20 years, providing enormous advances in high-fidelity spectral, spatial, and temporal measurements over existing systems. NPOESS will give civilians more precise advance warning of hurricanes and severe weather, reducing the potential loss of human life and property; and will revolutionize battlefield situational awareness with timely knowledge of the weather for use by the military to its advantage during conflicts and operations. Observation to delivery time will be just 15 minutes compared to the hours that are needed today. Finally, the capability to make measurements at precisely the same time each day maintains consistency in the long-term data records required for climate change analysis and assessment.

NPOESS Prime Contractor Responsibilities

Northrop Grumman is developing NPOESS under a contract awarded in August, 2002 by the NPOESS Integrated Program Office (IPO), which is jointly funded by the Department of Commerce and Department of Defense with participation from NASA. We are the prime contractor, responsible for overall system design, integration and performance. We are joined in this endeavor by a diverse team of subcontractors. Northrop Grumman Space Technology has the lead for system engineering and integration and the satellites. Our principal teammate and subcontractor, Raytheon, provides the ground segment products for command, control, communications and mission data processing and they also provide one of the most significant sensors on the spacecraft. Most sensors and a wide range of system components are provided by subcontractors from across the country. As a matter of fact, over 70 percent of the program is subcontracted effort.

NPOESS is being developed under a shared system performance responsibility (SSPR) contract, in which the government and contractor share both program risk and decisions. Our profit is at risk if the system doesn't perform. This is a powerful motivation to build a quality product that meets the Nation's needs.

NPOESS is among Northrop Grumman Space Technology's highest priority programs. As the prime contractor, we take responsibility for the current status of the program and we are committed to successfully resolving the technical, cost, and schedule challenges it faces. Our goal is mission success.

The NPOESS satellites will host 13 sensor types; seven have new or modified designs and the rest have designs similar to existing instruments or have already been built. The seven new or modified instruments are the Visible/Infrared Imager Radiometer Suite (VIIRS), the Ozone Mapper/Profiler Suite (OMPS), the Cross-track Infrared Sounder (CrIS), the Conical Scanning Microwave Imager/Sounder (CMIS), the Advanced Technology Microwave Sounder (ATMS), the Space Environmental Sensor Suite (SESS), and the Aerosol Polarimeter Sensor (APS). Recognizing that new sensors require a longer time for development, the IPO awarded development contracts for VIIRS, CrIS, OMPS and CMIS up to three years in advance of selecting Northrop Grumman as the prime contractor. The development of ATMS was done for NASA on a separate contract. The IPO sensor development work was subsequently transferred to Northrop Grumman. The SESS contract was awarded after Northrop Grumman became prime contractor, and the APS contract has not yet been awarded.

Northrop Grumman is also supplying the command, control, communications and data processing and on-orbit operations and support to the NPOESS Preparatory Project (NPP). NPP is a NASA mission with two purposes: (1) to provide data continuity between NASA's Earth Observing System science satellites and the NPOESS operational mission, and (2) to help in risk reduction for the deployment of the operational mission by flying selected instruments, installing the first-phase ground systems, and providing fully-processed data to users.

Historical Background

After completing the initial program baseline, Northrop Grumman learned of the Administration's FY04 and through FY07 budget cuts and FY03 Congressional budget reductions. These budget reductions directly impacted the NPOESS baseline and necessitated a complete replan of the program, which was completed in February 2004. We were directed to give NPP activities (sensor deliveries, ground system delivery, system integration, and mission operations preparations) a higher priority than down-stream NPOESS activities. As a result, contract funds originally intended for NPOESS were diverted to cover NPP-associated cost overruns and complete the NPP work.

NPOESS Program Status

The overall NPOESS system is making progress on many fronts. The ground data processing segment, the terrestrial communication network, and the spacecraft design are moving smoothly through development with no major issues. In June 2005, the System delta Preliminary Design Review (dPDR) was the capstone event for a top-to-bottom review of the NPOESS design. The review confirmed the soundness of the overall technical design and confirmed that the system would achieve the required technical performance. To support this review, we planned and executed a comprehensive set of six Preliminary Design Audits (PDAs) over the six months leading up to the formal, week-long System dPDR. The scope of this review was vast, spanning spacecraft, sensors, the ground segments, operations and support, system engineering, and end data product performance. During the review, more than 50 individual reviewers supporting seven review teams examined more than 570 design documents. The team successfully passed all PDAs and the dPDR, with no technical show-stoppers identified. The findings of the independent dPDR executive review team, comprised of highly experienced NASA, Aerospace, NGST/Raytheon, and User personnel, were complementary and beneficial for the next phase of development.

Both ground segment developments, including the Command, Control, and Communications Segment (C3S) and the Interface Data Processing Segment (IDPS), are proceeding according to plan. In October of this year, the team successfully completed the NPP portion of the C3S Factory Acceptance Test following six months of rigorous testing. Installation and integration of the C3S into all eight ground sites is scheduled to be complete by next May, with a Segment Acceptance Test next September.

Two of the four NPP sensors for the NPP risk reduction satellite are very mature in their development. The CrIS engineering development unit has been delivered to the spacecraft contractor for NPP, Ball Aerospace, for preliminary testing and the first CrIS flight unit will be delivered next spring. The ATMS engineering development unit and the flight unit, which were developed by Northrop Grumman Electronic Systems for NASA, have also been delivered. Delivery of these units has enabled Ball Aerospace to start performing initial interface testing of the sensors on the NPP spacecraft.

Current Program Estimates (Question 1)

When invited to appear before this committee, I was asked to respond to four specific questions. The first question asked for our current estimate of program cost and launch date, and the steps that need to be taken to firm up the cost and schedule estimate.

Earlier this year, as it became apparent the cost overruns associated with sensor development activity would exceed available reserves, we developed options for how to proceed with the overall program. We submitted more than 30 options to our customer and more recently, the Independent Program Assessment team, and anticipate receiving direction in early 2006 on the path forward. At that time, we will immediately begin developing a new program baseline which will require establishing a new detailed schedule and cost estimate for the program and renegotiated subcontracts with our suppliers. The entire process may be completed in the fourth quarter of 2006. In the meantime, the IPO has directed us to create detailed plans for FY06 that are consistent with the current FY06 budget and will allow the program to proceed on a solid footing while the long-range options are evaluated through December of this year. We are often asked about why this takes so long—the reason is the detailed planning required to ensure that over 60,000 networked tasks remain properly phased to meet program needs.

The restructured program cost and launch readiness dates will depend on the direction we receive following the government's assessment of options and the decision on the path forward. Relative to the question about cost and launch dates, I can summarize that launch delays for the first two satellites range from months to years, and the cost increases can be $1 billion or more, depending on the assumptions and ground rules of the options examined. I'd like to add that the number cited in the invitation letter as the September 2003 baseline of $7.4 billion is a figure Northrop Grumman does not recognize as directly associated with our contract. We regret the cost growth this program has experienced and recognize the impact it has on our customers, and consequently, have taken very substantial measures to fix the issues.

Sensor Development Challenges (Question 2)

The second question asked what Northrop Grumman Space Technology is doing to address the problems on the program and particularly what changes are we implementing in our oversight of the subcontractors.

More than 80 percent of the NPOESS cost growth and delay is attributable to the new instrument development activity. Northrop Grumman takes this responsibility very seriously and has responded with aggressive action to recover from the known problems. We have taken steps to correct systemic process issues that have been the root cause. As the prime contractor, it is our responsibility to oversee and manage the successful performance of all NPOESS subcontractors.

Five of the new sensors had passed early design reviews and were at different stages of development when Northrop Grumman was awarded the prime contract. After four of these sensor developments were transferred to NGST (ATMS remains under contract to NASA), we became aware that the instruments had some level of developmental challenge—but three instruments, VIIRS, OMPS, and CMIS—were experiencing unique problems that required sustained, tailored responses.

During an investigation into these problems, Northrop Grumman found that in some cases, the issues were isolated problems and responded to focused fixes. In other cases, however, the sensor problems resulted from systemic subcontractor process issues that required, and continue to require, broad-reaching Northrop Grumman and government intervention for proper resolution.

Northrop Grumman Space Technology has applied our own expertise and drawn on the resources of our corporation to assist the subcontractors. We are working closely with all the instrument subcontractors, but especially the VIIRS, OMPS, and CMIS subcontractors, by sharing our mission assurance, quality, hardware handling, software, testing, and design best practices, along with our program management best practices, to help them transition away from inadequate processes to a repeatable production process focus. In the long run, we believe these actions will improve our subcontractors' program performance and permit them to deliver production versions of the instruments, on-cost and on-schedule.

We are working diligently to put NPOESS on solid footing and have made organizational changes to further improve the performance of our instrument subcontractors. These changes include:

- Expanded and strengthened the expertise of our on-site and support subcontract management teams which are responsible for directing subcontractor program execution.
- Replaced the NGST NPOESS vice president and program director and the lead for the NPOESS sensors with very seasoned subcontract and program management expertise.
- Reassigned the NGST vice president for subcontracts to the NPOESS program as the NPOESS vice president and deputy program director to focus executive management attention on all NPOESS program suppliers.
- Made the vice president for subcontracts a direct report to the sector president to raise the level of oversight and review of all subcontractors across NGST.
- Instituted the practice of conducting technical and process "deep dives" into the subcontractor design and development activities at the first sign of problems utilizing Northrop Grumman expertise and resources. This intervention includes activities at the subcontractor's suppliers who are providing key components. We have co-located NGST engineers and program management at subcontractor facilities to help them solve problems.
- Increased the frequency of NGST-to-subcontractor executive communication meetings to assure issues are addressed rapidly.

A key lesson learned is to conduct early, extensive reviews of new subcontractors very soon after subcontract award, especially in cases where contractual responsibility is transferred. This is to ensure that supplier processes are robust and consistent with the comprehensive set of criteria we believe are needed for these developments and to ensure that development maturity is completely understood.

System Options (Question 3)

Your third question asked if Northrop Grumman made recommendations to the government on a path forward and what those options are. We spent many months studying alternatives at the request of our customer and have submitted more than 30 options to the IPO and more recently, the Independent Program Assessment team. These options are currently under consideration by the government.

Our criteria for these options were to fit within government specified funding limits, minimize life cycle costs, and meet defined mission objectives. The options involved trading increases in program schedule for reductions in near-term funding requirements. They also address reductions in scope, such as canceling a satellite or eliminating instruments. Options with longer schedules naturally increase the program's life cycle cost. The outcome of this planning activity, and subsequent additional cost growth, is heavily dependent upon the amount and timing of additional funds in FY06–08. Our list of options is extensive, and in the interest of a successful NPOESS program, we believe we have carefully considered every major option.

Moving Forward (Question 4)

As part of looking ahead and studying alternatives, we have concluded that additional funds in FY06 and FY07 would significantly lower the program risk. The additional funds would allow us to shorten the development schedule, significantly reduce life cycle costs, resolve risk issues sooner, and decrease chances of a gap in environmental data and weather coverage. Additional funds would enable us to optimize the development schedule of two key sensors, VIIRS and CMIS. VIIRS is on the critical path to the NPP launch and CMIS is on the critical path to the first NPOESS launch. Additional funding would also help facilitate transition to a less risky development for the system overall. Any estimate of how much cost and time might be saved is highly dependent on additional factors, such as how soon the funding would be available and how it maps to the out-year plans; but if no new funds are available, the resolution of these issues will take longer than desired.

Conclusion

In summary, the NPOESS program is healthy on many fronts. We have a lot of work to do to improve the technical capability and operability of three of our sensor packages, but we know how to do this and work is under way. We have provided more than 30 different scenarios to our government customers on the critical path forward, optimizing cost and schedule considerations. We await their direction to re-baseline this program and move forward. Our Northrop Grumman commitment to NPOESS mission success is solid, and the resources and talent of our professionals are extensive. If asked what I would recommend for this program, I would say that I hope that the government chooses to minimize schedule delays, minimize risk and deliver this critical operational capability into the hands of our war fighters and the severe weather forecasters as soon as is practically possible.

BIOGRAPHY FOR ALEXIS C. LIVANOS

Dr. Alexis Livanos is Northrop Grumman Corporate Vice President and Space Technology Sector President. In this role, he is responsible for the operations of the Sector, which develops a broad range of systems at the leading edge of space, defense, and electronics technology. Dr. Livanos also serves on the company's corporate policy council.

Previously, he led the turnaround of the Navigation and Space Sensors Division and established growth strategies in areas such as avionic systems and space sensors for use in the global war on terrorism.

Before joining Northrop Grumman in 2003, Dr. Livanos served as Executive Vice President of Boeing Satellite Systems where he was responsible for technology, engineering, manufacturing, supply chain management, and strategic relationships and ventures. He previously served as Deputy General Manager for the former TRW Electronic Systems and Technology Division. He also served as Program Manager for the GUARDRAIL program; Operations Manager for the Microwave Technology and Development Operations; Manager of the Microelectronics Center; and Microelectronics Manager of two highly successful restricted programs related to MILSTAR 1.

Throughout his career, Dr. Livanos gained expertise in the fields of advanced communications systems technology and technology insertions, hardware design, and satellite manufacturing and production, and has participated in the successful launch of 41 satellites.

Dr. Livanos earned a Bachelor's degree in mechanical engineering, a Master's degree in engineering science, and a Ph.D. in engineering science and physics from the California Institute of Technology, where he subsequently taught applied physics for two years as a post-doctorate fellow.

He is a member of the IEEE and serves on the Engineering Board of Counselors for the University of Southern California. He is also Chairman of the Advisory Council for the Graduate Aeronautical Laboratories at California Institute of Technology.

Chairman BOEHLERT. Thank you very much, Dr. Livanos.

When you go back to your office, would you remind your colleagues of how important their work is and how much their input is appreciated by those of us on Capitol Hill? Thank you very much.

Dr. POWNER. Thank you, Mr. Chairman.

Chairman BOEHLERT. The floor is yours.

STATEMENT OF MR. DAVID A. POWNER, DIRECTOR OF INFORMATION TECHNOLOGY MANAGEMENT ISSUES, GOVERNMENT ACCOUNTABILITY OFFICE

Mr. POWNER. Thank you, Mr. Chairman.

Chairman Boehlert, Ranking Member Gordon, Members of the Committee, we appreciate the opportunity to testify on NPOESS planned satellite system whose life cycle costs are now approaching the $10 billion mark. Since we last testified before Chairman Ehlers' Subcommittee on this program nearly two and one-half years ago, significant cost overruns and delays have occurred due, in part, to sensor development problems, poor contractor performance and program management.

The current direction for the program is at a standstill as options are being made to minimize the cost overruns, schedule delays, and effects on users.

This morning, as requested, I will summarize NPOESS's tentative cost and schedule, program risks, including those associated with key sensors, the status of options to move forward, and key management steps to reverse NPOESS's poor performance.

First, cost and schedule. Last fall, we reported that the overall program cost estimate had run approximately $1.2 billion, bringing the total cost to approximately $8 billion. Another large cost increase will soon be announced due to sensor development issues. We expect this increase to be about $1.4 billion, based on our analysis of recent contractor trends. This will bring the program's life cycle cost to about $10 billion.

The schedule for the launch of the first satellite has also been delayed further, and the potential gap in coverage that this committee has been monitoring for some time continues to grow. This means that our nation is decreasing its chance of having the data essential for weather forecasting and military operations.

When the NPOESS development contract was awarded, the schedule for launching of the first satellite was driven by a requirement that it be available as a backup to the launch of the final satellite if the predecessor post program fails. This meant that the first NPOESS satellite be available to back up the final POES satellite in December 2007.

My written statement indicates that the first NPOESS satellite will not be available for launch until December 2010, three years after it is needed to back up the final POES satellite. The written statements from Admiral Lautenbacher and Dr. Sega claim that this gap can now be up to four years. Therefore, should the final POES launch fail in December 2007, there will be no backup satellites for launch, and there could be a gap in satellite coverage, especially since the operational satellites will be at the end of their useful lives.

Regarding key program risks, the development of key sensors continues to pose significant risks. For example, the program continues to struggle with the technical complexity and component testing of the VIIRS sensor whose delivery is essential for the near-term risk reduction demonstration satellite that is to allow the program to work with sensors, ground control, and data processing systems well before the first NPOESS launch.

As a result of significant program cost growth, the current direction for the program is at a standstill as options to minimize future cost, schedule, and user impacts are being evaluated.

Until last week, we were told that five options were being considered that included removing a key sensor from the first satellite, delaying multiple launches, and not launching the risk reduction satellite. We recently have been informed that nine additional options exist. All of these would impact cost, schedules, and system users. NPOESS's Executive Committee plans to narrow these options in a meeting next week, obtain independent cost estimates of the selected options, and make a decision in December on the future direction of the program. Clearly, a timely decision is needed to inform this committee of future funding requirements to stabilize or even lessen the gap of satellite coverage, to re-negotiate contracts, to prepare users for data shortfalls, and to begin the turnaround in contractor and program performance.

Once the decision is made to move forward, improved management of this program will be essential to correct NPOESS's poor historical performance. This should include greater contractor oversight, more timely risk identification and escalation to key program executives, greater executive level oversight to monitor progress and to address future risks of this program's cost schedule and performance.

In summary, Mr. Chairman, NPOESS is a program in crisis. Although we commend efforts to study the issues so that the best decisions can be made to move forward, we are nearing a point where we need to stop studying and start managing this critical program. Moving forward with timely decision making will be more important than ever, as will continued oversight and strong leadership.

This concludes my statement. Thank you for your leadership and oversight of this critical acquisition.

[The prepared statement of Mr. Powner follows:]

PREPARED STATEMENT OF DAVID A. POWNER

Mr. Chairman and Members of the Committee:

We appreciate the opportunity to participate in today's hearing to discuss our work on the planned National Polar-orbiting Operational Environmental Satellite System (NPOESS) program. NPOESS is expected to be a state-of-the-art environment-monitoring satellite system that will replace two existing polar-orbiting environment satellite systems. Polar-orbiting satellites provide data and imagery that are used by weather forecasters, climatologist, and the military to map and monitor changes in weather, climate, the oceans, and the environment. The NPOESS program is considered critical to the United States' ability to maintain the continuity of data required for weather forecasting and global climate monitoring through the year 2020. At your request, we will discuss the NPOESS program's schedule, cost, trends, and risks, and describe plans and implications for moving the program forward.

This statement builds on other work we have done on environmental satellite programs over the last several years.[1] As agreed with your staff members, we plan to continue our oversight of this program. An overview of the approach we used to perform this work—our objectives, scope, and methodology, is provided in Appendix 1.

Results in Brief

Over the past several years, the NPOESS program has experienced continued schedule delays, cost increases, and technical challenges. The schedule for the launch of the first satellite has been delayed by at least 17 months (until September 2010 at the earliest), and this delay could result in a gap in satellite coverage of at least three years if the last satellite in the prior series fails on launch. Program life cycle cost estimates have grown from $6.5 billion in 2002 to $8.1 billion in 2004 and are still growing. While the program is currently reassessing its life cycle cost estimates, our analysis of contractor trends as of September 2005 shows a likely $1.4 billion contract cost overrun—bringing the life cycle cost estimate to about $9.7 billion. Technical risks in developing key sensors continue, and could lead to further cost increases and schedule delays.

As a result of expected program cost growth, the Executive Committee responsible for NPOESS is evaluating options for moving the program forward—and new cost estimates for those options. Key options under consideration in August 2005 included removing a key sensor from the first satellite, delaying launches of the first two satellites, and not launching a preliminary risk-reduction satellite. All of these options impact the program's cost and schedules, and the system users who rely on satellite data to develop critical weather products and forecasts—although the full extent of that impact is not clear. Further, last week we were informed that there are nine new options now under consideration, and all are likely to impact costs, schedules, and system users. Until a decision is made, the program remains without a plan for moving forward, and there are opportunity costs in not making a decision—some options are lost, and others may become more difficult. Given the history of large cost increases and the factors that could further affect NPOESS costs and schedules, continued oversight, strong leadership, and timely decision-making are more critical than ever.

Background

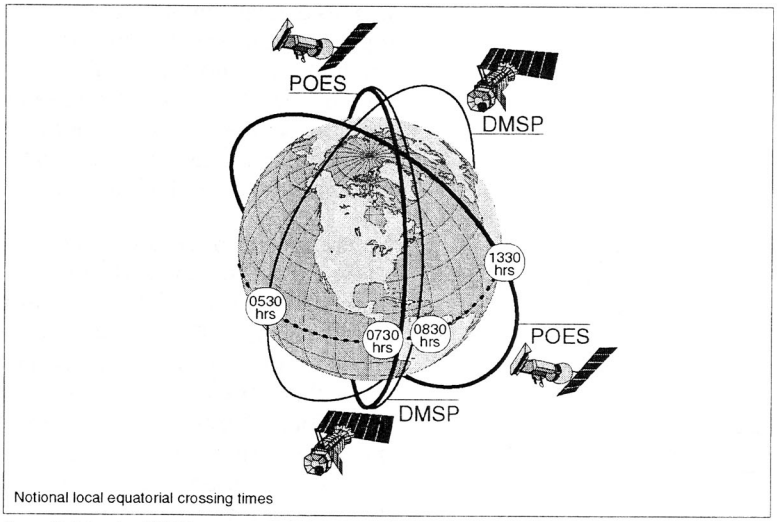
Since the 1960s, the United States has operated two separate operational polar-orbiting meteorological satellite systems: the Polar-orbiting Operational Environmental Satellites (POES), managed by the National Oceanic and Atmospheric Administration (NOAA) and the Defense Meteorological Satellite Program (DMSP) managed by the Department of Defense (DOD). The satellites obtain environmental data that are processed to provide graphical weather images and specialized weather products and are the predominant input to numerical weather prediction models. These images, products, and models are all used by weather forecasters, the military, and the public. Polar satellites also provide data used to monitor environmental phenomena, such as ozone depletion and drought conditions, as well as data sets that are used by researchers for a variety of studies, such as climate monitoring.

Unlike geostationary satellites, which maintain a fixed position above the Earth, polar-orbiting satellites constantly circle the Earth in an almost north-south orbit, providing global coverage of conditions that affect the weather and climate. Each satellite makes about 14 orbits a day. As the Earth rotates beneath it, each satellite views the entire Earth's surface twice a day. Currently, there are two operational POES satellites and two operational DMSP satellites that are positioned so that they can observe the Earth in early morning, mid morning, and early afternoon polar orbits. Together, they ensure that, for any region of the Earth, the data provided to users are generally no more than six hours old. Figure 1 illustrates the current operational polar satellite configuration. Besides the four operational satellites, six older satellites are in orbit that still collect some data and are available to provide some limited backup to the operational satellites should they degrade or fail. In the future, both NOAA and DOD plan to continue to launch additional POES and

[1] GAO, *Polar-orbiting Environmental Satellites: Information on Program Cost and Schedule Changes,* GAO–04–1054 (Washington, D.C.: September 30, 2004); *Polar-orbiting Environmental Satellites: Project Risks Could Affect Weather Data Needed by Civilian and Military Users,* GAO–03–987T (Washington, D.C.: July 15, 2003); *Polar-orbiting Environmental Satellites: Status, Plans, and Future Data Management Challenges,* GAO–02–684T (Washington, D.C.: July 24, 2002); *National Oceanic and Atmospheric Administration: National Weather Service Modernization and Weather Satellite Program,* GAO/T–AIMD–0086 (Washington D.C.: March 29, 2000); and *Weather Satellites: Planning for the Geostationary Satellite Program Needs More Attention,* GAO–AIMD–97–37 (Washington, D.C.: March 13, 1997).

DMSP satellites every few years, with final launches scheduled for 2007 and 2011, respectively.

Figure 1: Configuration of Operational Polar Satellites



Source: GAO, based on NPOESS Integrated Program Office data.

Each of the polar satellites carries a suite of sensors designed to detect environmental data that are either reflected or emitted from the Earth, the atmosphere, and space. The satellites store these data and then transmit them to NOAA and Air Force ground stations when the satellites pass overhead. The ground stations then relay the data via communications satellites to the appropriate meteorological centers for processing. The satellites also broadcast a subset of these data in real time to tactical receivers all over the world.

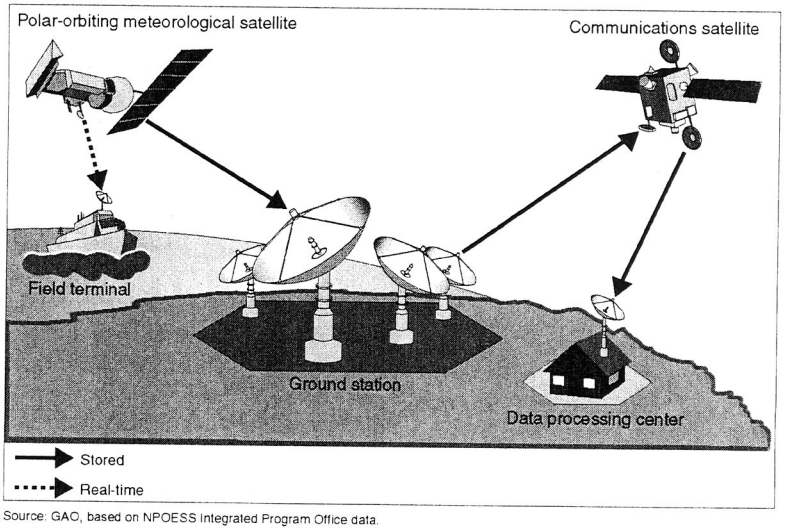
Under a shared processing agreement among four satellite data processing centers—NOAA's National Environmental Satellite Data and Information Service (NESDIS), the Air Force Weather Agency, the Navy's Fleet Numerical Meteorology and Oceanography Center, and the Naval Oceanographic Office—different centers are responsible for producing and distributing, via a shared network, different environmental data sets, specialized weather and oceanographic products, and weather prediction model outputs.[2] Each of the four processing centers is also responsible for distributing the data, to its respective users. For the DOD centers, the users include regional meteorology and oceanography centers, as well as meteorology and oceanography staff on military bases. NESDIS forwards the data to NOAA's National Weather Service for distribution and use by government and commercial forecasters. The processing centers also use the Internet to distribute data to the general public. NESDIS is responsible for the long-term archiving of data and derived products from POES and DMSP.

In addition to the infrastructure supporting satellite data processing noted above, properly equipped field terminals that are within a direct line of sight of the satellites can receive real-time data directly from the polar-orbiting satellites. There are an estimated 150 such field terminals operated by U.S. and foreign governments and academia. Field terminals can be taken into areas with little or no data communications infrastructure—such as on a battlefield or a ship—and enable the receipt of weather data directly from the polar-orbiting satellites. These terminals have their own software and processing capability to decode and display a subset of the

[2] These environmental data sets, specialized weather and oceanographic products, and weather prediction model outputs are produced through algorithmic processing. An algorithm is a precise set of procedures that enable a desired end result, such as a measurement of natural phenomena.

satellite data to the user. Figure 2 depicts a generic data relay pattern from the polar-orbiting satellites to the data processing centers and field terminals.

Figure 2: Generic Data Relay Pattern for the Polar Meteorological Satellite System



Source: GAO, based on NPOESS Integrated Program Office data.

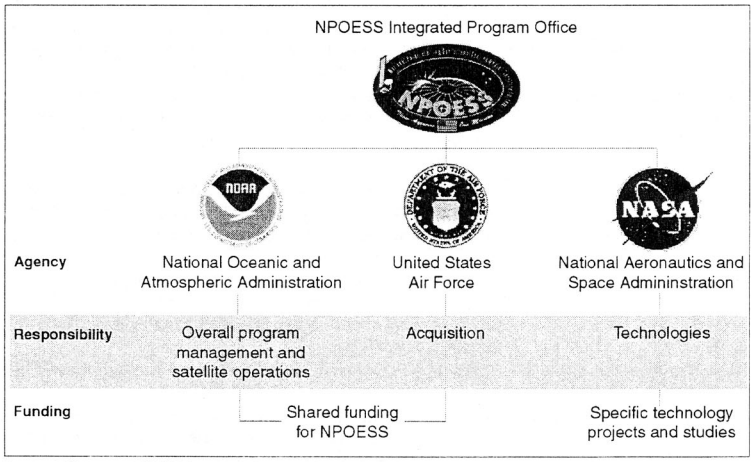
NPOESS Overview

Given the expectation that combining the POES and DMSP programs would reduce duplication and result in sizable cost savings, a May 1994 Presidential Decision Directive[3] required NOAA and DOD to converge the two satellite programs into a single satellite program capable of satisfying both civilian and military requirements. The converged program, NPOESS, is considered critical to the United States' ability to maintain the continuity of data required for weather forecasting and global climate monitoring through the year 2020. To manage this program, DOD, NOAA, and the National Aeronautics and Space Administration (NASA) formed a tri-agency Integrated Program Office, located within NOAA.

Within the program office, each agency has the lead on certain activities. NOAA has overall program management responsibility for the converged system and for satellite operations; DOD has the lead on the acquisition; and NASA has primary responsibility for facilitating the development and incorporation of new technologies into the converged system. NOAA and DOD share the costs of funding NPOESS, while NASA funds specific technology projects and studies. Figure 3 depicts the organizations comprising the Integrated Program Office and lists their responsibilities.

[3] NSTC–2, May 5, 1994.

Figure 3: Organizations Coordinated by the NPOESS Integrated Program Office



Source: GAO, based on NPOESS Integrated Program Office data.

Program acquisition plans call for the procurement and launch of six NPOESS satellites over the life of the program, as well as the integration of 13 instruments, consisting of 10 environmental sensors and three subsystems. Together, the sensors are to receive and transmit data on atmospheric, cloud cover, environmental, climate, oceanographic, and solar-geophysical observations. The subsystems are to support non-environmental search and rescue efforts, sensor survivability, and environmental data collection activities. According to the program office, seven of the 13 planned NPOESS instruments involve new technology development, whereas six others are based on existing technologies. In addition, the program office considers four of the sensors involving new technologies critical, because they provide data for key weather products; these sensors are shown in bold in Table 1, which lists the planned instruments and the state of technology on each.

Table 1: Expected NPOESS instruments (critical sensors in bold)

Instrument name	Description	State of technology
Advanced technology microwave sounder	Measures microwave energy released and scattered by the atmosphere and is to be used with infrared sounding data from NPOESS' cross-track infrared sounder to produce daily global atmospheric temperature, humidity, and pressure profiles.	New
Aerosol polarimetry sensor	Retrieves specific measurements of clouds and aerosols (liquid droplets or solid particles suspended in the atmosphere, such as sea spray, smog, and smoke).	New
Conical-scanned microwave imager/sounder	Collects microwave images and data needed to measure rain rate, ocean surface wind speed and direction, amount of water in the clouds, and soil moisture, as well as temperature and humidity at different atmospheric levels.	New
Cross-track infrared sounder	Collects measurements of the earth's radiation to determine the vertical distribution of temperature, moisture, and pressure in the atmosphere.	New
Data collection system	Collects environmental data from platforms around the world and delivers them to users worldwide.	Existing
Earth radiation budget sensor	Measures solar short-wave radiation and long-wave radiation released by the earth back into space on a worldwide scale to enhance long-term climate studies.	Existing
Ozone mapper/profiler suite	Collects data needed to measure the amount and distribution of ozone in the earth's atmosphere.	New
Radar altimeter	Measures variances in sea surface height/topography and ocean surface roughness, which are used to determine sea surface height, significant wave height, and ocean surface wind speed and to provide critical inputs to ocean forecasting and climate prediction models.	Existing
Search and rescue satellite aided tracking system	Detects and locates aviators, mariners, and land-based users in distress.	Existing
Space environmental sensor suite	Collects data to identify, reduce, and predict the effects of space weather on technological systems, including satellites and radio links.	New
Survivability sensor	Monitors for attacks on the satellite and notifies other instruments in case of an attack.	Existing
Total solar irradiance sensor	Monitors and captures total and spectral solar irradiance data.	Existing
Visible/infrared imager radiometer suite	Collects images and radiometric data used to provide information on the earth's clouds, atmosphere, ocean, and land surfaces.	New

Source: GAO, based on NPOESS Integrated Program Office data

In addition to the sensors and subsystems listed above, in August 2004, the President directed NASA and the Departments of Defense, the Interior, and Commerce to place a LANDSAT-like imagery capability on the NPOESS platform. This new capability is to collect imagery data of the Earth's surface similar to the current LANDSAT series of satellites, which are managed by the Department of Interior's U.S. Geological Survey and are reaching the end of their respective life spans. One instrument was launched in 1984 and is now long past its three-year design life; the newer satellite is not fully operational. LANDSAT is an important tool in environmental monitoring efforts, including land cover change, vegetation mapping, and wildfire effects. The decision to add a LANDSAT-like sensor to the NPOESS platform is currently being revisited by the President's Office of Science and Technology Policy and the Office of Management and Budget.

In addition, the NPOESS Preparatory Project (NPP), which is being developed as a major risk reduction and climate data continuity initiative, is a planned demonstration satellite to be launched several years before the first NPOESS satellite is to be launched. It is planned to host three of the four critical NPOESS sensors (the visible/infrared imager radiometer suite, the cross-track infrared sounder, and the advanced technology microwave sounder), as well as a noncritical sensor (the ozone mapper/profiler suite). NPP will provide the program office and the processing centers an early opportunity to work with the sensors, ground control, and data processing systems. Specifically, this satellite is expected to demonstrate the validity of about half of the NPOESS environmental data records[4] and about 93 percent of its data processing load.

NPOESS Acquisition Strategy

NPOESS is a major system acquisition that consists of three key phases: the concept and technology development phase, which lasted from roughly 1995 to early 1997; the program definition and risk reduction phase which began in early 1997 and ended in August 2002; and the engineering and manufacturing development and production phase, which began with the award of the development and production contract in August 2002 and will continue through the end of the program. Before the contract was awarded in 2002, the life cycle cost estimate for the program was estimated to be $6.5 billion over the 24-year period from the inception of the program in 1995 through 2018. Shortly after the contract was awarded, the life cycle cost estimate grew to $7 billion.

[4] Environmental data records are weather products derived from sensor data records and temperature data records.

When the NPOESS development contract was awarded, program officials identified an anticipated schedule and funding stream for the program. The schedule for launching the satellites was driven by a requirement that the satellites be available to back up the final POES and DMSP satellites should anything go wrong during the planned launches of these satellites. In general, program officials anticipate that roughly one out of every 10 satellites will fail either during launch or during early operations after launch.

Early program milestones included (1) launching NPP by May 2006, (2) having the first NPOESS satellite available to back up the final POES satellite launch in March 2008, and (3) having the second NPOESS satellite available to back up the final DMSP satellite launch in October 2009. If the NPOESS satellites were not needed back up the final predecessor satellites, their anticipated launch dates would have been April 2009 and June 2011, respectively.

In 2003, we reported that these schedules were subsequently changed as a result of changes in the NPOESS funding stream.[5] A DOD program official reported that between 2001 and 2002 the agency experienced delays in launching a DMSP satellite, causing delays in the expected launch dates of another satellite. In late 2002, DOD shifted the expected launch date for the final satellite from 2009 to 2010. As a result, the department reduced funding for NPOESS by about $65 million between fiscal years 2004 and 2007. According to program officials, because NOAA is required to provide the same level of funding that DOD provides, this change triggered a corresponding reduction in funding by NOAA for those years. As a result of the reduced funding, program officials were forced to make difficult decisions about what to focus on first. The program office decided to keep NPP as close to its original schedule as possible, because of its importance to the eventual NPOESS development, and to shift some of the NPOESS deliverables to later years. This shift affected the NPOESS deployment schedule. To plan for this shift, the program office developed a new program cost and schedule baseline.

After this new baseline was completed in 2004, we reported that the program office increased the NPOESS cost estimate from about $7 billion to $8.1 billion, and delayed key milestones, including the planned launch of the first NPOESS satellite—which was delayed by seven months.[6] The cost increases reflected changes to the NPOESS contract as well as increased program management funds. According to the program office, contract changes included extension of the development schedule, increased sensor costs, and additional funds needed for mitigating risks. Increased program management funds were added for non-contract costs and management reserves.

We also noted that other factors could further affect the revised cost and schedule estimates. Specifically, the contractor was not meeting expected cost and schedule targets of the new baseline because of technical issues in the development of key sensors. Based on its performance through May 2004, we estimated that the contractor would most likely overrun its contract at completion in September 2011 by $500 million. In addition, we reported that risks associated with the development of the critical sensors, integrated data processing system, and algorithms, among other things, could contribute to further cost increases and schedule slips.

NPOESS Schedules, Costs, and Trends Continue to Worsen

Over the past year, NPOESS cost increases and schedule delays have demonstrated worsening trends. NPOESS has continued to experience problems in the development of a key sensor, resulting in schedule delays and anticipated cost increases. Farther, contractor data show that costs and schedules are likely to continue to increase in the future. Our trend analysis shows that the contractor will most likely overrun costs by $1.4 billion, resulting in a life cycle cost of about $9.7 billion, unless critical changes are made. Program risks, particularly with the development of critical sensors, could further increase NPOESS costs and delay schedules. Management problems at multiple levels—subcontractor, contractor, program office, and executive leadership—have contributed to these cost and schedule issues.

NPOESS Sensor Problems Triggered Schedule Delays and Cost Increases

NPOESS has continued to experience problems in the development of a key sensor, resulting in schedule delays and anticipated cost increases. In early 2005, the program office learned that a subcontractor could not meet cost and schedule due to significant technical issues on the visible/infrared imager radiometer suite

[5] GAO–03–987T.
[6] GAO–04–1054.

(VIIRS) sensor—including problems with the cryoradiator,[7] excessive vibration of sensor parts, and errors in the sensor's solar calibration. These technical problems were further complicated by inadequate process engineering and management oversight by the VIIRS subcontractor. To address these issues, the program office provided additional funds for VIIRS, capped development funding for the conical-scanned microwave imager/sounder (CMIS) and the ozone mapper/profiler suite sensors, and revised its schedule in order to keep the program moving forward.

By the summer of 2005, the program office reported that significant technical issues had been resolved—but they had a significant impact on the overall NPOESS program. Regarding NPOESS schedule, the program office anticipated at least a 10-month delay in the launch of the first satellite (totaling at least a 17-month delay from the time the contract was awarded) and a six-month delay in the launch of the second satellite. A summary of recent schedule changes is shown in Table 2. The effect of these delays is evident in the widening gap between when the last POES satellite is expected to launch and when the first NPOESS satellite could be available if needed as a backup. This is significant because if the last POES satellite fails on launch, it will be at least three years before the first NPOESS satellite could be launched. During that time, critical weather and environmental observations would be unavailable and military and civilian weather products and forecasts would be significantly degraded.

As for NPOESS costs, program officials reported that the VIIRS development problems caused the program to overrun its budget, and that they need to reassess options for funding the program. They did not provide an updated cost estimate, noting that new cost estimates are under development. A summary of recent program cost growth is shown in Table 3.

Table 2: Program Schedule Changes

Milestones	As of August 2002 contract award	As of February 2004 (rebaseline)	As of August 2005	Net change from contract award	Minimum change from rebaseline	Potential data gap
NPP launch	May 2006	October 2006	April 2008	23-month delay	18-month delay	Not applicable
Final POES launch[a]	March 2008	March 2008	December 2007	4-month advance		Not applicable
First NPOESS satellite planned for launch	April 2009	November 2009	September 2010	17-month delay	10-month delay	Not applicable
First NPOESS satellite launch if needed to back up the final POES	March 2008	February 2010[b]	December 2010[c]	33-month delay		3-year data gap if final POES fails on launch
Final DMSP launch[a]	October 2009	May 2010	October 2011	24-month delay		Not applicable
Second NPOESS satellite planned for launch	June 2011	June 2011	December 2011	6-month delay	6-month delay	Not applicable

Source: GAO analysis, based on NPOESS Integrated Program Office data.

[a] POES and DMSP are not part of the NPOESS program. Their launch dates are provided because of their relevance to the NPOESS satellite schedules.

[b] A program official reported that if the first NPOESS satellite is needed to back up the final POES satellite, the contractor will prepare the satellite to be launched in a different orbit with a different suite of sensors. These factors will prevent launch from taking place until February 2010.

[c] If the first NPOESS satellite is needed to back up the final POES satellite, the contractor will prepare the satellite to be launched in a different orbit with a different suite of sensors, adding three months to the September 2010 launch date.

Table 3: Program Life Cycle Cost Changes

As of	Life cycle cost estimate	Life cycle range
July 2002	$6.5 billion	1995-2018
July 2003	$7.0 billion	1995-2018
September 2004	$8.1 billion	1995-2020
November 2005	To be determined	To be determined

Source: GAO analysis, based on NPOESS Integrated Program Office data.

[7] The cryoradiator is a key component of the VIIRS sensor. It is intended to cool down components of the sensor.

Trends in Contractor Data Show Continued Cost and Schedule Overruns; Overall Costs Projected to Grow

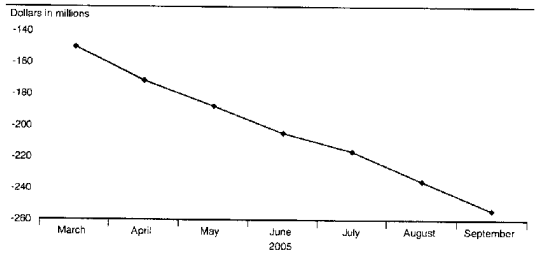
In addition to the overall program office cost and schedule estimates, it is valuable to assess contractor data to monitor the contractor's progress in meeting deliverables since contractor costs comprise a substantial portion of the overall program costs. NPOESS contractor data show a pattern of cost and schedule overruns—and a most likely contract cost growth of about $1.4 billion.

One method project managers use to track contractor progress on deliverables is earned value management. This method, used by DOD for several decades, compares the value of work accomplished during a given period with that of the work expected in that period. Differences from expectations are measured in both cost and schedule variances. **Cost variances** compare the earned value of the completed work with the actual cost of the work performed. For example, if a contractor completed $5 million worth of work and the work actually cost $6.7 million, there would be a -$1.7 million cost variance. **Schedule variances** are also measured in dollars, but they compare the earned value of the work completed to the value of work that was expected to be completed. For example, if a contractor completed $5 million worth of work at the end of the month, but was budgeted to complete $10 million worth of work, there would be a -$5 million schedule variance. **Positive variances** indicate that activities are costing less or are completed ahead of schedule. Negative variances indicate that activities are costing more or are falling behind schedule. These cost and schedule variances can then be used in estimating the cost and time needed to complete the program.

Using contractor-provided data, our analysis indicates that NPOESS cost performance continues to experience negative variances. Figure 4 shows the 6-month cumulative cost variance for the NPOESS contract. From March 2005 to September 2005, the contractor exceeded its cost target by $103.7 million, which is about 9 percent of the contractor's budget for that time period. The contractor has incurred a total cost overrun of $253.8 million with NPOESS development only about 36 percent complete. This information is useful because trends often tend to continue and can be difficult to reverse unless management attention is focused on key risk areas and risk mitigation actions are aggressively pursued. Studies have shown that, once programs are 15 percent complete, the performance indicators are indicative of the final outcome.

Based on contractor performance from March 2005 to September 2005, we estimate that the current NPOESS contract will overrun its budget—worth approximately $3.4 billion—by between $788 million and $2 billion. Our projection of the most likely cost overrun is about $1.4 billion. The contractor, in contrast, estimates about a $371 million overrun at completion of the NPOESS contract. Adding our projected $1.4 billion overrun to the prior $8.1 billion life cycle cost estimate and the project office's estimated need for $225 million in additional management costs brings the total life cycle cost of the program to about $9.7 billion.

Figure 4: Cumulative Cost Variance of the NPOESS Contract over a 6-Month Period

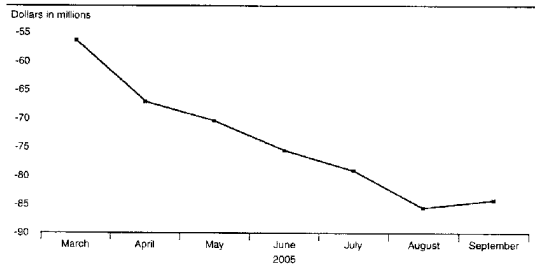


Source: GAO analysis based on NPOESS Integrated Program Office Data.

Our analysis also indicates that the contract is showing a negative schedule variance. Figure 5 shows the six-month cumulative schedule variance of NPOESS. From March 2005 to September 2005, the contractor was unable to complete $27.8 million worth of scheduled work. In September, the contractor was able to improve its overall schedule performance because of an unexpectedly large amount of work being completed on the spacecraft (as opposed to the sensors). It was not a reflection of an improvement in the contractor's ability to complete work on the critical sensors.

Specifically, performance on the development of critical sensors over the past six months continued to be poor, which indicates that schedule performance will likely remain poor in the future. This is of concern because an inability to meet contract schedule performance could be a predictor of future rising costs, as more spending is often necessary to resolve schedule overruns.

Figure 5: Cumulative Schedule Variance of the NPOESS Contract over a 6-Month Period



Source: GAO analysis based on NPOESS Integrated Program Office Data.

Risks Could Further Affect NPOESS Cost and Schedules

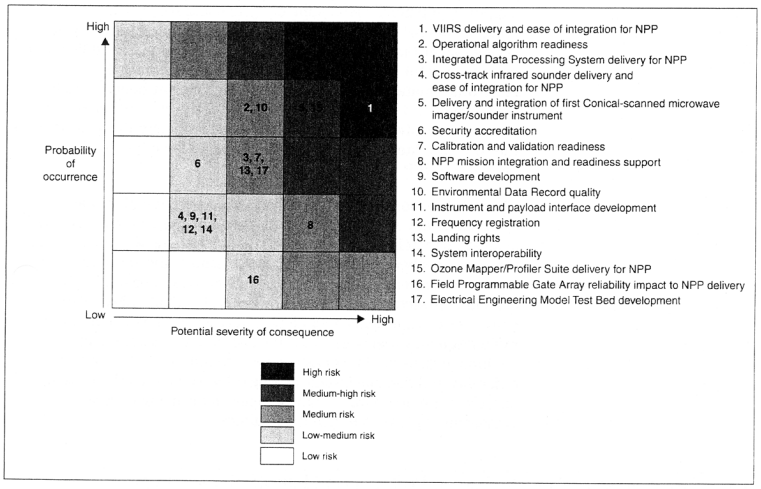
Risk management is a leading management practice that is widely recognized as a key component of a sound system development approach. An effective risk management approach typically includes identifying, prioritizing, resolving, and monitoring project risks.

Program officials reported that they recognize several risks with the overall program and critical sensors that, if not mitigated, could further increase costs and delay the schedule. In accordance with leading management practices, the program office developed a NPOESS risk management program that requires assigning a severity rating to risks that bear particular attention, placing these risks in a database, planning response strategies for each risk in the database, and reviewing and evaluating risks in the database during monthly program risk management board meetings.

The program office identifies risks in two categories: program risks, which affect the whole NPOESS program and are managed at the program office level, and segment risks, which affect only individual segments[8] and are managed at the integrated product team level. The program office has identified 17 program risks, including 10 medium to medium-high risks. Some of these risks include the delivery of four sensors (VIIRS, CMIS, the cross-track infrared sounder and the ozone mapper/profiler suite) and the integrated data processing system; and the uncertainty that algorithms will meet system performance requirements. Figure 6 identifies the 17 program risks and their assigned levels of risk.

[8] These segments are identified as (1) overall system integration, (2) the launch segment, (3) the space segment, (4) the interface data processing segment, and (5) the command, control, and communications segment.

Figure 6: Key Program Risks as Identified by the NPOESS Program Office, as of August 2005



Source: NPOESS Integrated Program Office.

Managing the risks associated with the development of VIIRS, the ozone mapper/profiler suite, the cross-track infrared sounder, the integrated data processing system, and algorithm performance is of particular importance because these are to be demonstrated on the NPP satellite that is currently scheduled for launch in April 2008. The risks with the development of CMIS are also important because CMIS is one of the four critical sensors providing data for key weather products.

At present, the program office considers two critical sensors—VIIRS and CMIS—to present key program risks because of technical challenges that each is facing. In addition to the previously reported VIIRS problems, the sensor continues to experience significant problems dealing with the technical complexity of the ground support equipment. The testing of optical and solar diffuser components has also been more challenging than expected and is taking longer than planned to complete. In addition, the delivery of components for integration onto the sensor, including the electronics material from two subcontractors, has been behind schedule due to technical challenges. Until the current technical issues are resolved, delays in the VIIRS delivery and integration onto the NPP satellite remain a potential threat to the expected launch date of the NPP.

The CMIS sensor is experiencing schedule overruns that may threaten its expected delivery date. Based on the prime contractor's analysis, late deliveries of major CMIS subsystems will occur unless the current schedule is extended. For example, the simulator hardware is already expected to be delivered late, based on the current contractual requirement of December 2006. CMIS also continues to experience technical challenges in the design of the radio frequency receivers, the structure, and the antenna. In addition, extensive effort has been expended to resolve system reliability and thermal issues, among other things. To the program office's credit, it is aware of these risks and is using its risk management plans to help mitigate them.

Current Program Issues Due, in Part, to Problems at Multiple Management Levels

Problems involving multiple levels of management—including subcontractor, contractor, program office, and executive leadership—have played a role in bringing the NPOESS program to its current state. As noted earlier, VIIRS sensor development issues were attributed, in part, to the subcontractor's inadequate project management. Specifically, after a series of technical problems, internal review teams sent by the prime contractor and the program office found that the VIIRS subcontractor had deviated from a number of contract, management, and policy directives set out by the main office and that both management and process engineering were inadequate. Neither the contractor nor the program office recognized the underlying

problems in time to fix them. After these issues were identified, the subcontractor's management team was replaced. Further, in January 2005, the NPOESS Executive Committee (EXCOM) called for an independent review of the VIIRS problems. This independent review, delivered in August 2005, reported that the program management office did not have the technical system engineering support it needed to effectively manage the contractor, among other things. Additionally, the involvement of NPOESS executive leadership has wavered from frequent heavy involvement to occasional meetings with few resulting decisions. Specifically, the EXCOM has met five times over the last two years. Most of these meetings did not result in major decisions, but rather triggered further analysis and review. For instance, program officials and the program's Tri-Agency Steering Committee[9] identified five options to present at the executive committee meeting in mid-August 2005 and expected to receive direction on how to proceed with the project. The EXCOM did not select an option. Instead, it requested further analysis of the options by another independent review team, and an independent cost estimate by DOD's Cost Analysis Improvement Group.

Sound management is critical to program success. In our reviews of major acquisitions throughout the government, we have reported that sound program management, contractor oversight, risk identification and escalation, and effective and timely executive level oversight are key factors determining a project's ability to be delivered on time, within budget, and with promised functionality.[10] Given the history of large cost increases and the factors that could further affect NPOESS costs and schedules, continued oversight, strong leadership, and timely decision-making are more critical than ever.

Options for Moving Forward Are under Consideration, but Cost, Schedule, and Impact on Users Are Not Fully Understood

In August 2005, the program office briefed its Executive Committee on the program's cost, schedule, and risks. The program office noted that the budget for the program was no longer executable and offered multiple alternatives for reconfiguring the program. Specifically, the program office and contractor developed 26 options during the March to August 2005 timeframe. Of these options, the Tri-Agency Steering Committee selected five options, shown in table 4. All of these options alter the costs, schedules, and deliverables for the program. While the options' preliminary life cycle cost estimates range from $8.8 billion to $9.2 billion, they all involve reductions in functionality and limited probabilities for meeting schedules within the cited budgets. None of the options presented discussed the potential for adding funding in the short-term to hold off longer-term life cycle cost increases.

Table 4: Selected program options

Option description	Estimated cost increase*/ Preliminary life cycle cost estimate	Schedule change on first and second planned satellite launches (called C-1 and C-2)	Probability of meeting schedule within cited budget	Performance change:
Delay first and second NPOESS satellite launches and do not include the CMIS sensor on C-1	$948 million/ $9.0 billion	C-1 launch delayed by 10 months; C-2 launch delayed by 6 months	50 percent	CMIS sensor not included on C-1
Cancel the last POES satellite; delay launch of C-1 and C-2; and do not include the CMIS sensor on C-1	$948 million/ $9.0 billion	C-1 launch delayed by 16 months C-2 launch delayed by 16 months	75 percent	CMIS sensor not included on C-1
Cancel NPP; delay C-1 and C-2 launches	$758 million/ $8.9 billion	C-1 launch delayed by 10 months; C-2 launch delayed by 6 months	40 percent	
Cancel NPP; delay C-1 and C-2 launches; and defer CMIS until C-2	$676 million/ $8.8 billion	C-1 launch delayed by 10 months; C-2 launch delayed by 6 months	70 percent	CMIS sensor not included on C-1
Cancel C-1, use European satellite data in its place	$1.105 billion/ $9.2 billion	C-1 cancelled; C-2 unchanged	60 percent	Does not meet critical performance requirements

Source: NPOESS Integrated Program Office data.

*Cost increases include contract costs and $225 million for the program office.

[9] The Tri-Agency Steering Committee reviews and consolidates issues for the Executive Committee and provides oversight of the program office.

[10] For example, GAO, *High-Risk Series: An Update,* GAO–05–207 (Washington, D.C.: January 2005) and *Major Management Challenges and Program Risks: Department of Transportation,* GA0–03–108 (Washington, D.C.: January 2003).

Project officials anticipated that at its August meeting, the EXCOM would decide on an option and provide directions for keeping the project moving. However, EXCOM officials requested further analysis and detailed cost estimates, and they deferred a decision among alternatives until December 2005.

New Options Under Consideration Would Affect Cost, Schedule, and System Users; Full Extent Unknown

Last week, we learned that in addition to the five options presented in August 2005, program executives are considering nine new options. While we were not provided any details about the nine new options, program officials informed us that they too will affect NPOESS costs, schedule, and promised functionality for system users—although their full impact is not yet clear. Program officials expect the EXCOM to decide on a limited number of options on November 22, 2005, and to obtain independent cost estimates of those options and make a decision to implement one of the options in December 2005. After a decision is made, the prime contractor will need time to develop more precise cost estimates and the program office with need to renegotiate the contract. Until a decision is made, the program remains without a plan for moving forward. Further, there are opportunity costs in not making a decision—that is, some options may no longer be viable, contractors are not working towards a chosen solution, and other potential options become more difficult to implement.

Clearly, timely decisions are needed to allow the program to move forward and for satellite data users to start planning for any data shortfalls they may experience. Until a decision is made on how the program is to proceed, the contractor and program office cannot start to implement the chosen solution and some decisions, such as the ability to hold schedule slips to a minimum, become much more difficult.

In summary, NPOESS is a program in crisis. Over the last few years, it has been troubled by technical problems, cost increases, and schedule delays. Looking forward, technical challenges persist; costs are likely to grow; and schedule delays could lead to gaps in satellite coverage. Program officials and executives are considering various options for dropping functionality in order to handle cost and schedule increases, but the full impact of these options is not clear. Moving forward, continued oversight, strong leadership, and informed and timely decision making are more critical than ever.

This concludes my statement. I would be pleased to respond to any questions that you or other Members of the Committee may have at this time.

Appendix I

Objectives, Scope, and Methodology

Our objectives were to (1) discuss the National Polar-orbiting Operational Environmental Satellite System (NPOESS) program's schedule, cost, trends, and risks and (2) describe plans and implications for moving the program forward. To accomplish these objectives, we focused our review on the Integrated Program Office, the organization responsible for the overall NPOESS program. We also met with officials from the Department of Defense, the National Aeronautics and Space Administration, and NOAA's National Weather Service and National Environmental Satellite Data and Information Service to discuss user needs for the program.

To identify schedule and cost changes, we reviewed program office contract data, the Executive Committee minutes and briefings, and an independent review team study, and we interviewed program officials. We compared changes in NPOESS cost and schedule estimates to prior cost and schedule estimates as reported in our July 2002[11] and July 2003 testimonies[12] and in our September 2004 report.[13]

To identify trends that could affect the program baseline in the future, we assessed the prime contractor's cost and schedule performance. To make these assessments, we applied earned value analysis techniques[14] to data from contractor cost performance reports. We compared the cost of work completed with the budgeted costs for scheduled work for a six-month period, from March to September 2005, to show trends in cost and schedule performance. We also used data from the reports to estimate the likely costs at the completion of the prime contract through established earned value formulas. This resulted in three different values, with the middle value being the most likely. We used the base contract without options for our earned value assessments.

To identify risks, we reviewed program risk management documents and interviewed program officials. Further, we evaluated earned value cost reports to determine the key risks that negatively affect NPOESS's ability to maintain the current schedule and cost estimates.

To assess options and implications for moving the program forward, we reviewed the five options presented at the Executive Committee briefing and met with representatives of the National Weather Service and National Environmental Satellite Data and Information Service to obtain their views on user's needs and priorities for satellite data.

NOAA officials generally agreed with the facts presented in this statement and provided some technical corrections, which we have incorporated. We performed our work at the Integrated Program Office, DOD, NASA, and NOAA in the Washington, D.C., metropolitan area, between June 2005 and November 2005, in accordance with generally accepted government auditing standards.

BIOGRAPHY FOR DAVID A. POWNER

Dave is currently responsible for a large segment of GAO's information technology (IT) work, including systems development, IT investment management, and cyber critical infrastructure protection reviews. He has nearly 20 years of both public and private information technology-related experience. In the private sector, he held several executive-level positions in the telecommunications industry, including overseeing IT and financial internal audits, and software development associated with digital subscriber lines (DSL). At GAO, he has led reviews of major IT modernization efforts at Cheyenne Mountain Air Force Station, the National Weather Service, the Federal Aviation Administration, and the Internal Revenue Service. These reviews covered many information technology areas including software development maturity, information security, and enterprise architecture. Dave has an undergraduate degree from the University of Denver in Business Administration and is

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[11] GAO, *Polar-orbiting Environmental Satellites: Status, Plans, and Future Data Management Challenges,* GAO–02–684T (Washington, D.C.: July 24, 2002).

[12] GAO, *Polar-orbiting Environmental Satellites: Project Risks Could Affect Weather Data Needed by Civilian and Military Users,* GAO–03–987T (Washington, D.C.: July 15, 2003).

[13] GAO, *Polar-orbiting Environmental Satellites: Information on Program Cost and Schedule Changes,* GAO–04–1054 (Washington, D.C.: September 30, 2004).

[14] The earned value concept is applied as a means of placing a dollar value on project status. It is a technique that compares budget versus actual costs versus project status in dollar amounts. For our analysis, we used standard earned value formulas to calculate cost and schedule variance and forecast the range of cost overrun at contract completion.

a graduate of the Senior Executive Fellows program at Harvard University's John F. Kennedy School of Government.

DISCUSSION

COST OVERRUNS

Chairman BOEHLERT. Thank you very much, Mr. Powner.

You know, those of us in government, whether we are the Executive Branch or the Legislative Branch, are pretty darn good at underestimating. We usually underestimate costs and we are darn sure all of us underestimate overruns.

So I think at the outset we need to make sure we understand the magnitude of the problem we are dealing with here. We just heard from GAO. Our witnesses today, those of you other than GAO, talk about cost increases being at least 15 percent for about a billion dollars. Let us get a little more specific than that. Our understanding is that the figures, based on current information, are more likely an increase of at least $2 billion and probably $3 billion and maybe even more. Is that right, Admiral Lautenbacher?

Vice Admiral LAUTENBACHER. Yes, the rough order of magnitude that we have seen from our independent analysis, program analysis, is it could be $2 billion to $3 billion. And remember that those are ballpark estimates, as they claim at this point accurate for one significant digit, so we need to be very careful about how we use those costs as precise measurements of what the future might look like at this point.

Chairman BOEHLERT. Dr. Sega, I am assuming that your answer would be the same.

Dr. SEGA. The strength of the Independent Program Assessment Team is principally in the technology and the management areas. That is why we additionally asked the OSD CAIG, the folks that have greater expertise in cost estimation, to give their view of what the costs are. We will have that next week on the program of record. I don't know what the costs are at this point.

Chairman BOEHLERT. You find it hard to argue, I assume, with the GAO testimony just reported to us.

Dr. SEGA. I agree with that, and I would also point out that as one goes forward in a complex system development, especially one that has many different sensors, that there is the risk in the integration phase of this work. And so as we get the input into the technology aspects, we also would need to look at the integration risk of this system, which is quite complex.

Chairman BOEHLERT. Thank you.

Dr. Livanos.

Dr. LIVANOS. The options that we have worked through range from about $1.2 billion to $1.3 billion all of the way up to $2.5 billion, and a lot depends on the scenario and the funding profiles and the restrictions of the funding curves as well as what is the desire for minimizing or optimizing system performance, and how the scenarios fit together.

FUNDING LEVELS AND DELAYS

Chairman BOEHLERT. It is sobering.

Dr. Livanos has testified that additional funds in 2006 and 2007 would allow Northrop Grumman to shorten the development schedule of this program. Now we hear that all of the time, Dr. Livanos. That is understandable. Boeing and Raytheon have told us the same thing. The Independent Program Assessment that you and Dr. Sega commissioned, Admiral Lautenbacher, to evaluate the NPOESS program also supports this conclusion. Yet, in your testimony, you say that additional funding in 2006 and 2007 would not buy back any schedule delays. Now you are talking about cost overruns in the billions, and you are talking about delay in the capability of something that I think we all can agree is critically important. How can you make such an absolute statement in this matter?

Vice Admiral LAUTENBACHER. The Independent Program Analysis Team went out and looked at the technical risks, as Dr. Livanos has mentioned. That is their strength. They took a look at the plan. You mentioned before we have got new players and we have a new playbook. We are trying to build a new playbook. I think that is important, too. Part of the optimism or aggressiveness in the schedule that was created originally before I inherited the program included concurrent development of the first engineering unit and the first flight unit for VIIRS. As we have gotten into VIIRS and found out how difficult it is to overcome some of the technical challenges, that appears to us today not to be a wise decision. That is the information that we have to date. So we are looking at trying to contain the schedule risk with the funding risk. So we believe the best way to do this is to do it the old-fashioned way, do it head to tail. Do the engineering model and make sure it works. It tests. It works. And then apply that to the flight unit. If you do that, there is enough money to rearrange in the program in 2006 to allow us to take care of some of the other initial developments like the CMIS sensor, which we believe is the next big one to take a look at in terms of its impact on cost and schedule.

Chairman BOEHLERT. But are you——

Vice Admiral LAUTENBACHER. I am not—we are not locked into this, but this is what we have from the initial look, which the IPA gave us in the last meeting. So I am reporting to you exactly what we have available for our use at this point. And I am just——

Chairman BOEHLERT. You are not contradicting the statement. You are not telling us that more money would have no impact on the schedule?

Vice Admiral LAUTENBACHER. I am telling you that there is no way to buy back this schedule. More money is not going to buy back this schedule.

Chairman BOEHLERT. Are you speaking for the CAIG for the EXCOM?

Vice Admiral LAUTENBACHER. Well, I am——

Chairman BOEHLERT. Yeah, because more——

Vice Admiral LAUTENBACHER. I am telling you what I heard——

Chairman BOEHLERT. This is so much more than just about NOAA and about predicting weather. We all know how important that is, particularly in the aftermath of Katrina. But this is about national security and the operations of the military. I mean, you know, Dr. Sega and DOD and the Air Force are not partners in

this, you know, simply because they are looking for new avenues to share some of their money. I mean, there is a strategic interest and a very important national security purpose. When you are talking about big gaps in capability, that is cause for concern. So that is why we are not lending to the concept that you have to put more money in 2006 and 2007, but we are looking at that possibility. And the preliminary indications are that it might promote—it might have a positive impact on the schedule and reduce the gap when we don't have the capability, and it would save a lot of dollars. I mean, those are two worthy objectives.

Dr. Sega, and then my time is up.

Dr. SEGA. Mr. Chairman, if I could address two parts of this. One is the capability gap.

The Department of Defense principle input is the DMSP satellites. Our assessment is the functional availability gap for us occurs in 2012 with the current systems. We have four additional DMSP satellites to launch: 17, 18, 19, and 20. We are engaged in a Service Life Extension Program in those satellites. Two of the components include solid state recorders, we have had some failures of recorders in the past, as well as many IMUs to mitigate some of the problems that we have had on gyros. We believe that that is a step that may see even additional light of the DMSP satellites. So our look is to future—our functional availabilities gap with the current estimates of satellites is around 2012.

Some of the satellites, the CMIS sensors, are not as mature as they should be at this phase of the program. For example, the CMIS sensor, the Conical-scanning Microwave Imager Sounder, is at the—stage at this point. That would normally be assessed in the four range. One wouldn't start integration with technology at that level. So we have asked the Independent Program Assessment Team to, in addition to looking at the overall program, to make their estimates of what the TRL levels are of the various components.

Chairman BOEHLERT. Now NOAA has a gap before you do, and some people would suggest, while it is an equal cost-sharing partnership, there is a greater degree of interest and urgency on the part of NOAA than on the Air Force. And maybe you are somewhat reluctant partners in terms of where you would put this on your priority scale versus where NOAA, out of necessity, must put it in its priority scale. How would you address that?

Dr. SEGA. Sir, I only address it from the DOD standpoint. There is enhancement, clearly, to the spatial and spectral resolution that—and the frequency when you have additional satellites, such as POES and then NPOESS, in the constellation for weather sensing. So the weather models would be better. But in terms of where the needs threshold is for the Department of Defense is as I stated with the additional functional availability. I think partnerships are good.

Chairman BOEHLERT. Thank you.

My time has expired.

Mr. Gordon.

Mr. GORDON. Thank you, Mr. Chairman.

Admiral Lautenbacher, in your testimony, you stated that additional funding in fiscal year 2006 and 2007 wouldn't allow you to

go back to the original—wouldn't, as you said, buy back the timeline. That is correct. But what it will do, which has been well stated over and over, is that it will reduce future slippage. It will reduce future increased slippage in time or slippage in budget. So no, you can't get back what has already been wasted, but you can make preparations not to waste more time and money. That is the difference.

And I would like to ask you some questions, please.

EXCOM AND DECISION-MAKING

On March the 31st, the prime contractor briefed your program management team on cost and schedule problems with the program. At that time, they laid out three scenarios to fix this program. All of them assumed a year and a half slip in schedule on delivery of the first satellite and showed growth—a cost growth of up to $800 million over the life of the program. General Kelly told our staff that he personally told you there were programs and costs problems. Do you recall that?

Vice Admiral LAUTENBACHER. Yes, I was aware that there were cost and schedule problems.

Mr. GORDON. And you chaired the Executive Committee for this program with participation of NASA and DOD, is that correct?

Vice Admiral LAUTENBACHER. I am a co-chair, equal partner from the three agencies.

Mr. GORDON. And when did EXCOM meet to determine a course forward for this program?

Vice Admiral LAUTENBACHER. The EXCOM met to look at the analysis of all of this information in August.

Mr. GORDON. August 19, even though you had had this information for quite some time. Now between April the 1st and August the 19th, the contractors were working out options and the Integrating Program Office was evaluating these options, is that correct?

Vice Admiral LAUTENBACHER. And the tri-agency steering group was meeting as well to evaluate it, so the chain was working on trying to come to grips with the issues that the contractor presented to us during that time.

Mr. GORDON. And General Kelly was chairing that tri-agency steering committee meeting during this time, looking at the options, and you were aware of that?

Vice Admiral LAUTENBACHER. Again, he is one of three. He is a member of a tri-party committee. So he is one of the co-chairs.

Mr. GORDON. Now on April the 19th, General Kelly at TSC was told there were two critical dates coming up. First, the EXCOM had to make a planning roadmap decision by June the 1st. Second, the EXCOM would have to make a decision on a preferred option by August the 1st. If this didn't happen, you would lose flexibility on the options and likely incur higher costs. General Kelly was asked to carry this message to the EXCOM, which you chaired. Did General Kelly tell you that early decision had to be made to keep options open and costs down?

Vice Admiral LAUTENBACHER. We had discussions on when we should make decisions on options, and looking at the information that we had——

Mr. GORDON. Sir, did General Kelly tell you about the June 1 and August 1 deadlines that were necessary?

Vice Admiral LAUTENBACHER. I don't remember whether he said June 1 or August 1. We talked about the fact that people are asking for some decisions and deadlines.

Mr. GORDON. So if you knew that your own managers believed you had to move quickly at EXCOM to keep all options open and save money, why did EXCOM not meet until August the 19th?

Vice Admiral LAUTENBACHER. We planned to have a meeting. Based on the availability of information, it made sense to analyze. It took time to get that information together and to base it on something that is factual. And in that time, what we found that—was that the IPO, in our view, did not have the cost-estimating abilities that it should have independently and that we were relying totally on contractor costs. That is a weak basis, in my view, on which to make a final decision on the future of the program. We wanted to get as much information as we could together for the EXCOM to ensure usefulness of the meeting, sir.

Mr. GORDON. And so it took you from March the 31st to come to the conclusion that you couldn't trust those figures?

Vice Admiral LAUTENBACHER. During that time, the numbers kept changing. Things kept coming up. There were things—it didn't settle down. It didn't—it was not—it wasn't a set of clear-cut options where all of the questions were answered, the questions that GAO asked, that they are still asking.

Mr. GORDON. What was constant during that entire time, though—what was constant was that by planning for additional funds in 2006 and 2007 would both save money in the long run as well as to hopefully stop future slippage?

Vice Admiral LAUTENBACHER. We were looking at options that included the funding in fiscal year 2006 at that point.

Mr. GORDON. But wasn't that the consensus from—that you were being told from all outside sources?

Vice Admiral LAUTENBACHER. I don't know if it was the consensus of all outside sources, because I don't know what all of the outside sources were.

Mr. GORDON. All of the ones that were reporting to you on this issue.

Vice Admiral LAUTENBACHER. We were looking at options, as we did in the EXCOM. We were looking at options that added funding, some funding in fiscal year 2006 and some in fiscal year 2007 and other funding in the years, you know, beyond fiscal year 2008 and out.

Mr. GORDON. Well, it looks to me like—I used to call it a "rope a dope," but whether it is a slow down or whatever it might be in the decision-making process is going to cost the taxpayers a lot of money. And I just hope, as I said in my opening statement, this is not an attempt to run the clock out so that you can turn this problem and real mess over to someone else.

Vice Admiral LAUTENBACHER. I assure you that this is not an attempt to run out the clock. As most of you know, I eat, sleep, breathe, and live NOAA. I wake up in the middle of the night worrying about these issues. I want to make sure this program is funded, because I am part of having to deal with the funding issues

that we have. I am leaning for it as much as anybody in this committee to try to get the right answers and to save the taxpayer money. We will——

Mr. GORDON. Well, somewhere decisions have to be made. Somewhere you are going to have to make a decision.

Vice Admiral LAUTENBACHER. We did. We made decisions along the way to execute the fiscal year 2005 funding and execute the fiscal year 2006 funding. And that was the critical piece of this to try to keep the windows of opportunity as open as far as possible to ensure that we could come up with the optimum solution that could pass budget muster, that would pass muster with this committee, and deliver the satellite on time.

Mr. GORDON. Thank you. And can I expect that the materials—information that we have requested that you have not provided us will be provided? And if so, when?

Vice Admiral LAUTENBACHER. I again want to assure the Committee that I am dedicated to providing as much information as the Committee needs as fast as I can get it there. We have delivered a number of volumes. The remaining material is under the interagency review process run by OMB. I cannot control that directly, and I regret that, but I will do everything I can to move the rest of the material over. As I said, we have already delivered, you know, a number of volumes and expenses material, and we will continue to provide everything the Committee wants.

Mr. GORDON. Thank you, sir.

Chairman BOEHLERT. Thank you very much.

Dr. Ehlers.

LAUNCH SCHEDULE AND FUNDING

Mr. EHLERS. Thank you, Mr. Chairman.

First of all, I would like to just clarify an issue. Admiral Lautenbacher, your testimony doesn't address the schedule shift as clearly as—I just don't quite get a clear picture there. Dr. Sega says that NPOESS will launch no earlier than fiscal year 2012. Is that—do you agree with that prediction? Am I following the question?

Vice Admiral LAUTENBACHER. Yes, I believe that 2012 is a reasonable ballpark estimate based on the range of options and our understanding of the technical difficulties. Yes.

Mr. EHLERS. Then what—can you say what problems that will cause for NOAA, if that is the actual date?

Vice Admiral LAUTENBACHER. We will have to look at launching on request versus launching on schedule for the final POES. We believe that we can, with the shifting of the NPP in orbit, changing the orbit time for NPP, delaying the launch of the final POES, that we can make up the gap that we have with the schedule. So there is an option that allows us to maintain continuity. It requires everything to work well.

Mr. EHLERS. Okay. The next—a series of questions here.

Dr. Livanos, you said in your testimony that additional funding in fiscal year 2006 and 2007 would—a series of questions, would significantly reduce life cycle costs. I assume I heard that correctly. And my question to the other members of the panel is do you agree or disagree with that? In other words, would additional funding in

fiscal years 2006 and 2007 significantly reduce life cycle costs? We will go right to left this time. Mr. Powner.

Mr. POWNER. Well, clearly when you look at additional funds in 2006 and 2007 we have differences of opinions on whether you can buy back the schedule and whether that will reduce life cycle costs. With most of these programs, you can buy back some schedule and you can reduce life cycle costs with funds. What we have not seen—we have only seen the five options that have been—our understanding is there were 20-some options prior to the five options, and those options did address 2006 and 2007 funding, buying back the schedule and reducing life cycle costs. So we are not in a position to say how much that could buy back or, in fact, how much we could reduce life cycle costs. But clearly that is something that should be revisited.

Mr. EHLERS. Okay.

Dr. Sega, your response to that? Will the earlier funding reduce significantly life cycle costs?

Dr. SEGA. Sir, that is not clear to me whether it would or it would not. Depending on what work needs to be done in fiscal year 2006 and fiscal year 2007 and what our constellation looks like after we have made these decisions will determine what the funding profile would be. If we are best served to mature the technology of needed sensors prior to integration, then the funding profile should reflect that. So—and until we lay out a concrete plan of where we are going forward, I think it is premature to lay out a funding strategy.

Mr. EHLERS. And when would you suggest that concrete plan to be laid out?

Dr. SEGA. It is certainly our hope and expectation that after the 22nd of November meeting, in which we will be able to bring down the number of options that we think are reasonable for further work, two or three or so, and——

INDEPENDENT PROGRAM ANALYSIS (IPA)

Chairman BOEHLERT. Would the gentleman yield for just a second on that, and I won't take it out of your time? The IPA is due when?

Dr. SEGA. The IPA is to brief out on November 22 at our next EXCOM, as is the CAIG with respect to the program of record. To make decisions along the way of life cycle cost and so forth, you would do the CAIG estimates against the option you plan on pursuing. And so you need to look at a few options and run out the numbers in terms of whether or not those options are going to be favorable toward life cycle cost as well as what the funding profile would be recommended under those options. That would be the plan.

Chairman BOEHLERT. So could we see those results next week, on, what, the 22nd?

Dr. SEGA. Sir, I will speak for myself. As we have done with the Independent Program Assessment, the government had the briefings from the IPA, at which point we offered, and it was accepted, taking the briefings of the IPA and the people to brief Members of Congress and staff.

Chairman BOEHLERT. So the IPA gives you the report?

Dr. SEGA. That is correct.

Chairman BOEHLERT. Can we get the report simultaneous with that from IPA?

Dr. SEGA. That has not normally been the process. We probably—we ask the questions—some of the issues in terms of the questions there are to clarify facts in there, and so we generally take in the first shot at the IPA and ask questions, and not long after that it has been offered, in our case, to our oversight committees. I think that is a reasonable——

Mr. GORDON. The Chairman asked a question. I mean, I guess he deserves a yes or no. Will you do it or not?

Dr. SEGA. Yeah.

Chairman BOEHLERT. You know, you said it is not normal, but it is not normal to have billions of dollars in cost overruns——

Dr. SEGA. Sure.

Chairman BOEHLERT.—or a problem of this magnitude. We are talking about years in delay of a critical capability. So we are on the same team. We are trying to sort this out together.

Dr. SEGA. I understand.

Chairman BOEHLERT. And the more——

Dr. SEGA. And——

Chairman BOEHLERT.—information that we get, the better able we are to make a positive contribution to the overall process.

Dr. SEGA. I can request we will try to do it as expediently as possible. I don't know if there are any restrictions. There—the work is done. The draft—and we will take a look at——

Chairman BOEHLERT. Well, we are talking about gaps, a very limited gap——

Dr. SEGA. I understand.

Chairman BOEHLERT.—between the time you get it and the time you share it with us so that we can work collaboratively.

Dr. SEGA. I appreciate that. And——

Chairman BOEHLERT. Thank you very much.

Dr. Ehlers, back to you.

LAUNCH SCHEDULE AND FUNDING (CONT.)

Mr. EHLERS. Oh, thank you.

Continuing on with the same question, Admiral Lautenbacher, the—if the additional funding were available in 2006 and 2007, do you believe that it would significantly reduce life cycle costs?

Vice Admiral LAUTENBACHER. That is if you believe that the—it is tied up with the risks for schedule and cost. We would have to look at them—and performance. So they are all tied together. I have some doubts, as Dr. Sega does, that it would. I am more persuaded, at this point, that it wouldn't do us a whole lot of good, because we would be gaining—we would still be in the same schedule risk problem that we have today with the technical challenges, which I mentioned changing the playbook, that the Chairman mentioned, which I think is vitally important to this program because of the technical challenges involved. So I am not going to sit here and say categorically that I know that adding money in 2006 isn't going to change the life cycle costs. It probably could if you could deliver on the risk. But one accepts some risk with the concurrency that is in the program now and building these instruments and as-

suming you can overcome those things, which we have not been able to overcome in the last year or two as we have gone from a view graph program to a real program delivering hardware. So that is where I am on that. I am persuaded that getting rid of the concurrency is going to help us to actually deliver a program on the lowest risk, most cost-efficient pathway.

Mr. EHLERS. Well, let me ask another. If you think additional funding in 2006 and 2007 would help resolve looming technical problems earlier? Let us go back the other way. Admiral?

Vice Admiral LAUTENBACHER. Yes, and I will tell you what I do know or what I do believe from the detailed information that I have. I believe on VIIRS that it probably really would not. I don't know enough about CMIS to be able to answer that question, that is why I suggest that we are looking at ways to get some funding into CMIS further in front so we can—so I can answer that question more—in more detail of whether it will or will not. But we should be able to do that within the 2006 funding that we have now, we believe.

Mr. EHLERS. Dr. Sega, would the additional funding in 2006 and 2007 help resolve looming technical problems earlier?

Dr. SEGA. Sir, extending the answer that I gave before, it is going to depend on exactly what those technical problems are. Now I visited the folks in Santa Barbara and went through the activities that are undergoing there on VIIRS to take a personal look at what some of the process problems have been and some of the technical challenges are, and I think my impression—and again I would ask for others with a more detailed analysis, my impression going through the process where they are at in terms of the engineering developing unit work, the test that needs to be done on that prior to proceeding to the flight unit, where they are at is the schedule they can hold. I don't know if you can accelerate that much more in fiscal year 2006.

Mr. EHLERS. Okay. If I understand that, that goal we had set that it would help resolve the technical problems. Let me just ask Mr. Powner.

Mr. POWNER. Chairman Ehlers, it is unclear whether additional funds would help resolve those technical problems. I think it will clearly help resolve some technical problems, or several. One, improve subcontractor performance. I think Dr. Livanos clearly pointed that out. But also, too, the oversight needs to occur from the executive position, as Dr. Sega mentioned, along from the prime's oversight, too. My impression to those subcontractors will clearly help identify those technical risks and ensure that they get the resolution. So it is a bit unclear whether additional funds will help, but this oversight pressure from these executives will clearly help address those technical issues.

Mr. EHLERS. I might ask you what penalty is incurred by the subcontractors that are not performing adequately.

Mr. POWNER. I am not clear on the penalties for sub-optimal performance.

Mr. EHLERS. Does anyone have a comment on that? Dr. Livanos.

Dr. LIVANOS. Yes, sir. We have an award fee structure that the outcome of the award fee structure depends on the performance of the contractor. So that is what we use to motivate the subcon-

tractor in a positive and a negative way. Furthermore, the Raytheon in Santa Barbara team has put their own incentive award system for everybody that is working on this program to get rewarded when they actually meet the deadlines in the baseline program that was set together last December.

Mr. EHLERS. I would assume they would not receive any positive—the company would not receive any positive reward?

Dr. LIVANOS. We make the award fee estimation based on a certain set of criteria, and certainly cost and schedule are among them. But since last December on the rebate slide schedule of the VIIRS program, I think we are one and one-half months behind. And we did have a three-month slack on the schedule. So we are driving it very hard, sir.

Chairman BOEHLERT. The gentleman's time has expired. And I did not take time—of your time.

Mr. Wu.

DELAYING COSTS

Mr. WU. Thank you very much, Mr. Chairman.

I want to follow up on questions that Chairman Ehlers and Ranking Member Gordon asked earlier.

And I think it has just been eluded to thus far, but let me just put it bluntly. I would prefer not to call it standard practice, but it is not that uncommon a practice to hold costs down in the next fiscal year or two and let costs balloon in the out-years, knowing that it is not going to be on your watch. And there has been some discussion here today about whether we can buy back the schedule for the current fiscal year or the next fiscal year. The consensus seems to be that the probability of that is relatively low, but the probability of being able to get back further on schedule and to hold down life cycle costs in the overall length of the program may be significant, and yet we are holding current costs down. Are you telling this committee that there is no practice, as is done sometimes in business and sometimes in government, of holding the current costs down and letting the costs bubble out later or balloon out later, that—Admiral, Doctor, that that is not going on here?

Vice Admiral LAUTENBACHER. From my perspective, it is absolutely not going on. We are looking at this program and trying to deliver it. Remember that the current schedule is basically a 50 percent risk level. I mean, you know. Half good and half bad. I don't think we should throw money at maintaining that kind of odds. If we are going to put money on things, we ought to raise the schedule risk to a point where we know we are going to win on this, and that, to me, saves money and delivers the program.

Mr. WU. Dr. Sega, do you agree with that assessment?

Dr. SEGA. Congressman, it is important to look at this series of options that we will have in front of us. Some may not be the exact program we have in place now, the baseline program. And so to get capability to orbit may not include all of the sensors. That is one of the options. It may include a strategy of spiraling in to capability and later satellites. For example, GPS–I, GPS–II. An incremental improvement in building the process and looking at those technologies that are mature going forward. We have increased our——

Mr. WU. I only have five minutes.

Dr. SEGA. I am sorry.

Mr. WU. Can you try to focus on the question?

Are you holding down current costs and running the risks of ballooning out later timelines and later costs?

Dr. SEGA. Absolutely not.

Mr. WU. Absolutely not? And Dr. Sega, Admiral Lautenbacher, can you tell this committee that there has been absolutely no pressure brought upon either of your agencies to hold costs down currently and let the risks run further out, whatever those might be?

Chairman BOEHLERT. Well, while they are formulating their answers, I would hope there is pressure on everyone in the government to hold down costs but not at the expense of critically important technology development or sacrificing the timeline. But I know what you are getting at, so we will let them respond.

Vice Admiral LAUTENBACHER. Yeah, there is no pressure on me to do something abnormal with this program based on the cost and schedule. The Administration is interested in delivering on this program. Obviously, we have to deal with the budget pressures, and we are not going to take lightly the request for more funds, but you know, in the time—I have been in public service for 40 years in the Navy and testified over here in the Science Committee. You know that I have always asked for money when I need it, and I have not been shy about supporting and being an advocate for the programs that I am in charge of. And I will continue to do that.

Dr. SEGA. Over my last three months on the job, we are increasing the rigor in terms of government oversight in our projects. We have increased presence of government folks at key sensors in NPOESS. We have done that in other systems. We are working toward an 80-percent confidence estimate on what we intend to do to look at those technologies that are at a mature state prior to doing—that cuts down on cost and risk.

Mr. WU. Dr. Sega, again, I only have five minutes, and I would like—my color on the light has switched to yellow.

Has there been any pressure of that sort brought to bear upon you or people in your office? Yes or no?

Dr. SEGA. No, sir.

Mr. WU. Dr. Powner—or Mr. Powner, your team has been following this program for quite some time, and you indicate in your testimony that it is very, very important that decisions be made in a timely manner or that options will simply be foreclosed because of untimely decisions or a lack of action. And it appears that the management structure that we are talking about here, the Executive Committee, the tri-agency steering committee, the Integrated Program Office, that—you know, quite simply, there seem to be a lot of cooks in the kitchen here for a very, very complex structure, and it may not have been able to follow-up on developments and respond with decisions in a timely manner. What is your team's assessment of the decision-making structure that has been set up to look over to guide this program thus far?

Mr. POWNER. Well, I think we have a typical decision-making structure. We have a prime contractor overseeing the subs. And we have a situation here where the subcontractors, and particularly the subcontractor on the key sensors, did not deliver.

Mr. WU. Okay.

Mr. POWNER. So it is important that we still have the government and prime contractor overseeing folks. But from the decision-making point of view, looking at this Executive Committee, it is extremely important that we get a decision on this quickly. The more we linger on the decision, we understand the meeting is going to occur next week and there is going to be a decision in December. That is very important, because we are hearing dates like contracts re-negotiated next fall, new baselines at the end of 2006. We are going to be pushing up against the 2008 budget at that point in time. So we need to get a decision timely, much timelier than we have had in the past. And I think the key question is if we can have a decision this December.

Chairman BOEHLERT. The gentleman's time has expired.

And the gentleman has stated the case. He did not have just five minutes. He had more than six minutes, and we were glad to share them, because the line of questioning was very important.

Is there anyone else that wishes to—yeah, do you expect—let me—Admiral Lautenbacher and Dr. Sega, do you expect a decision in December?

Vice Admiral LAUTENBACHER. It is always hard to predict the future, but that is our plan. We need to have good results presented to us in terms of the options we ask for in this meeting coming up, and then we need the CAIG to deliver on cost estimates that they have confidence in and that they can show us that they have done an exhaustive study as——

Chairman BOEHLERT. So November 22?

Vice Admiral LAUTENBACHER. November 22.

Chairman BOEHLERT. So 30 to 60 days is reasonable to expect some specificity in terms of the direction you are going to chart for us?

Vice Admiral LAUTENBACHER. The CAIG's history has been that they need 30 to 60 days to do what we would call a credible, independent estimate and provide us with that information. And we will push that as hard as we can.

Chairman BOEHLERT. Dr. Sega.

Dr. SEGA. That is the CAIG's numbers, so they will say 60 days in terms of returning and we hope it is for 30.

Chairman BOEHLERT. Thank you.

The gentleman——

Mr. WU. I thank the Chairman for the extra minute.

Chairman BOEHLERT. Well, you made a valuable contribution, as you usually do. Thank you very much.

The Chair recognizes Mr. Schwarz.

SATELLITE COVERAGE AND FORECAST DEGRADATION

Mr. SCHWARZ. Admiral Lautenbacher and Under Secretary Sega, your written testimony, you indicate, one of you, that—again, that weather satellite coverage could cause some degradation in global weather models. Another of you indicated—I guess that this is the GAO, says forecasts would be significantly degraded. How much degradation are we talking about here? Are we talking about, you know, five percent, 10 percent, 50 percent, close to 100 percent, first? And secondly, who else has got polar-orbiting weather satellites up there? You alluded to some. And are they commercial or

government satellites that other folks have that, again, I have heard from your testimony where we could get information if we don't have ours up and operating at an appropriate time?

Vice Admiral LAUTENBACHER. The polar-orbiting satellites—let me—this is a hard question to answer, because it is like in the military, it is a defense in depth. There is a series of instruments that provide information to weather models. If you look at what we do today, in terms of the volume of data that goes into weather models, 90 percent of the data comes from satellites. And a good piece of that comes from—40 or 50 percent of that comes from the polar-orbiting satellites.

Mr. SCHWARZ. Why—let me just clear this up just for my edification. Why is a polar-orbiting satellite better than a satellite, for instance, in another type of orbit? Why is a polar orbit better for weather prediction?

Vice Admiral LAUTENBACHER. Two reasons. The geostationary satellite gives you constant view all of the time. You can watch the hurricanes and all of that. We have two of those, but that is 22,400 miles from the Earth. The polar-orbiting satellites, first of all, give you the coverage of the whole globe, and they do it at about 400 miles. The resolution and the volume of information from other parts of the Earth that you need to put into these large-scale models, which will then feed into the regional models, is very valuable to us. Put it that way.

Now the people that have satellites, the European equivalent of NOAA intends to launch a series of—just like—not like NPOESS, but a series of—well, they are getting into the polar physics right now. We have operational polar satellites. The Chinese and the Japanese are looking at it, as well as the Koreans. In terms of the operational polar network, the United States has cornered the market on it, at this point, in terms of how we use it and how it is operational.

Mr. SCHWARZ. So there is an opportunity here, a possibility, I wouldn't class it as an opportunity, for a significant degradation of our ability?

Vice Admiral LAUTENBACHER. There is, but we are looking at options, I think—I believe that we could work our way out of this.

Mr. SCHWARZ. Mr. Secretary, is that your feeling, as well?

Dr. SEGA. Congressman, our professional needs, our functional availability for satellites will not show a gap until 2012. Augmenting it with additional sensing data improves from the spatial and spectral resolution, which is important. It improves some of the modeling. We tend to look at smaller areas to sort of focus in terms of our work. So it is an improvement. We are looking forward to NPOESS, but our base threshold is met on the 2012 current satellites.

Mr. SCHWARZ. Your base threshold is met out to 2012, but there is the—after the degradation, then, if there is, in fact, degradation, would commence on or in the 2012 or on or about 2012?

Dr. SEGA. With the current estimate of lifetime and so forth, it would be complete. We have 17, 18, 19, and 20 on the ground still. We are improving them from a service flight extension aspect. We hope that their lifetime actually will exceed the average lifetime of

those on orbit. We have had one satellite, I believe it has been up for over 140 months.

Mr. SCHWARZ. Thank you, sir.

Thank you, Mr. Chairman.

Chairman BOEHLERT. Just let me follow up on that. Good question.

How much degradation? I mean, can you give us an estimate? Is it five percent? Is it 50 percent? Can you give us a ballpark estimate?

Vice Admiral LAUTENBACHER. It is situational. It depends on where the storms are and the kind of information they are getting. So to say, well, all of the weather is going to be degraded by such and such, 25 percent, would be false, because in many cases, it will be all right. In some cases, you may degrade it 50 percent. So you could have situations where you rely on that data, if you don't have enough other sensor data, to provide building the models and you have difficult situations, fast reacting fronts, loss of systems that are——

Chairman BOEHLERT. So actually, your situational cause for concern in our——

Vice Admiral LAUTENBACHER. It should be. And that is a concern of ours as well. I just can't tell you to sit here and say every one of the forecasts will be degraded 25 percent. We can't make that statement, because that is not true. It would be a range of estimates. Maybe 50 percent in cases, and that is the ballpark, based on my, you know, science knowledge to, perhaps, just a few percent in some cases.

Chairman BOEHLERT. Thank you.

Mr. Udall.

IPA RECOMMENDATIONS

Mr. UDALL. Thank you, Mr. Chairman.

I want to thank the panel for being here today.

I thought that I would turn to Dr. Sega. And it is good to see you again.

I think you are familiar with these IPA options, which are relatively new, and Mr. Powner and the GAO haven't had a chance to look at them, but I would be curious to get their opinion as well.

What I read these to say is that we are reducing risk, and the cheapest way forward is to make these investments sooner rather than later. Would you care to comment on that from your perspective?

Dr. SEGA. Congressman Udall, it is going to be unwarranted to look at a plan ahead and what satellites that we need to fly at the earliest time. There is a plan ahead if you continue with the baseline program. There is also a plan ahead if you proceed with one of the options. In addition to the options that you saw with the IPA at their interim report in October, we are looking to see additional options, which I believe that they have, in the meeting next week. And so it is based on the options set and how you phase the development of the technology, the funding, and the on-orbit capability.

Mr. UDALL. Is there any way that we could stick to the baseline?

Dr. SEGA. The large numbers that you see in terms of dollars and the large risk to cost, schedule, and technical performance is in the baseline program. We would have to look at that really hard.

Mr. UDALL. And I am not sure that is a no, but I think the elements of—I think you—all of the panel here on the Committee is expressing great concern and a significant amount of frustration and particularly in context of the IPA document and their recommendations, in which I think simply put, they suggest that you spend these dollars up front. You reduce the risk and it is the cheapest way forward. And if that includes also this—of course schedule slip is always a possibility, but you reduce the cost and the potential for significant schedule slip. If you care to comment, Dr. Sega.

Dr. SEGA. There are examples of previous programs where you ran the—a parallel approach to reduce the schedule time and forewent the option of having an engineering development unit. We do not believe that is good practice. I believe the industry would also concur that the development of an engineering unit and testing unit and understanding the technology prior to going to the operational flight unit is the last thing to do. And so when you apply some of these best practices, you end up seeing a schedule that moves to the right from what was currently baselined.

Mr. UDALL. It seems to me that you are spending resources now to analyze the technical risks and work with the instrumentation parallel to the other work that is underway, that that would be a very reasonable and important investment. But I hear a contravening point of view being expressed on that in that regard. And Dr. Sega, do you have an additional comment on making those investments now?

Dr. SEGA. In the case of the engineering development unit, there are basically two teams working: one on the engineering developing unit and one on the flight unit. When you basically move them into serial configuration, then the workforce is reduced, because you concentrate on the engineering development unit, learn from it, and apply those lessons learned from the flight unit. So in that case, you have reduced the effort in that period of time where you had parallel efforts going, and now you have moved them to serial activities. So you have to lay this out through the whole program to understand really where we are at.

Mr. UDALL. I appreciate your testimony.

I move to Mr. Powner. I want to thank the GAO for shining a light on this situation. And could you comment on how, from your point of view, spending additional money in the next two years would help manage risk, which I think is the extent of what we are trying to understand?

Mr. POWNER. Yeah, we are not aware of those specific options that you laid out, Congressman Udall. But clearly, on most programs, money now can help reduce risks in the near-term, long-term, and also reduce life cycle costs. We are hopeful that these nine options that we have heard about that will be discussed next week incorporate some of those thoughts so that we can fully explore those options. We haven't seen that to date. Clearly it was not in the five options, but we are hoping that it is in the nine.

Chairman BOEHLERT. All right. Thank you very much.

The gentleman's time has expired.

November 22 is the key date. And then shortly thereafter, we hope that you will be forthcoming with very specific recommendations, because we are all working toward the same goal: eliminating the gap, limiting the cost, and providing the maximum capability for not only weather forecasting but for national security.

With that, the Chair recognizes the distinguished gentleman from California, Mr. Rohrabacher.

COST OVERRUNS AND FUNDING PRIORITIES

Mr. ROHRABACHER. Thank you, Mr. Chairman.

This committee has its highs and lows, inspired by great achievements in space, NASA put that probe right on that comet, you know, hundreds of thousands of miles away or billions of miles away. That was just so impressive. And—you know, and then we have our—go from our peaks to our valleys, and we are sort of sitting here with our feet stuck in the mud, watching, for example, after billions of dollars being spent and all of the focus of NASA, and the foam keeps falling off of the Shuttle. And this, unfortunately, is one of those moments where we seem to be in a valley, and it seems to be depressing. And this is a depressing analysis of failure and, perhaps, incompetence that we are hearing today. And I might add, this done at the cost of billions of dollars to the American taxpayer at a time when it really counts, at a time when this Congress is trying to come up with savings in our budgets to pay for the suffering of our people who suffered through these natural disasters. And now we hear about billions of dollars in your industry that just basically has gone right down the toilet. And it is—as I say, this is depressing.

And specifically, Mr. Chairman, it is clear that someone has dropped the ball, and perhaps more importantly, somebody dropped the satellite, which hasn't been discussed here. This—and it appears to be—now correct me if I am wrong. This program, if it is successful and we move forward, is likely to cost twice as much as when we originally talked about it when this was approved. Already we spent $3 billion, and the program's costs have risen by over 50 percent. Correct me if I am wrong, but that sounds like what we are headed for.

So with $3 billion already spent, your testimony today is the program is at a standstill. Mr. Chairman, that is $3 billion that we have spent. $3 billion. And our testimony is the program is at a standstill. It is basically dead in the water. $3 billion. I don't need to go through all of the things that $3 billion—where we could spend it on that would help improve the lives of the people of this country, and perhaps the safety of our military who are over in Iraq right now.

And what I am also hearing today, Mr. Chairman, is that it is the subcontractors' fault. Let us blame the subcontractors. Well, all of this is unacceptable. It is totally unacceptable.

And let me make one suggestion. Let me ask your opinion on one, perhaps, fundamental flaw in the system. Someone must have approved and said that the sensors could be built that would make this a successful program before we approved the program. Somebody must have said that. Well, should—now obviously they

couldn't, because right now, we are hearing that maybe—that the problem with the fundamental technology that is necessary for the success of the program. That is the sensors. And from the testimony I am hearing today, we don't know if those—if we really have that sensor technology. Why, after $3 billion, is there a question about whether the fundamental technology necessary for the success of the program is possible or not? Doesn't this indicate that there is a flaw in our system when we go forward and spend that much money, approve such a big program, and now he is telling us we don't know if the sensors can work? Come on. Correct me. Move forward. There is. Show me where I am wrong in that analysis.

Admiral, go right ahead.

Vice Admiral LAUTENBACHER. Yes, let me talk just a few minutes.

The sensors—this program, looking in retrospect—I was not here at the beginning of the program, as many of us—neither of us at the table were.

Mr. ROHRABACHER. I know. It is the subcontractors' fault or it is the guy's fault before you.

Vice Admiral LAUTENBACHER. I am not saying that at all. I am telling you how the program started. The program started, as many programs do, on an aggressive schedule and an aggressive cost, and aggressive technical, I don't want to say breakthroughs, but developments. We are a very entrepreneurial nation. We have—as you have said, we have put probes on the asteroids, and we are able to do these things. So we can accept them as commonplace. We are going to have a technical breakthrough every time. So this program was, in my view, built on an optimistic basis. As it went along, the development of the sensors—and by the way, risk reduction measures were put in place for the sensors. It wasn't like the people four or five years ago didn't know that this was an issue that we had to develop these sensors and integrate them. So time was added. In fact, the contracts and the process was started earlier to allow this——

Mr. ROHRABACHER. And that didn't work.

Vice Admiral LAUTENBACHER. And—you are right.

Mr. ROHRABACHER. Okay. So wouldn't it be better for us, in the future, Mr. Chairman, if we are going to approve projects like this, and Admiral, wouldn't you say that it would be rational for us to say that we have identified those fundamental technologies in a project like this that are necessary for the success of the program to make sure that they both are built prior to us spending billions of dollars on other elements of the program?

Chairman BOEHLERT. If I might interrupt at this juncture. I think the gentleman is making it absolutely clear that the critical design and review has to be more rigorous. He is absolutely right.

Mr. ROHRABACHER. Well, you have to go to the heart of the matter. And if they told us in the beginning that, oh, we can do these sensors, somebody must have said that. Well, now, obviously, the word of those technologists doesn't mean diddly squat, and we need to make sure that before we move forward with billions of dollars in spending, that the technology isn't just "we can probably do that" or "we know we can do that," but that it has already been done. And it is based on proven technologies.

Chairman BOEHLERT. Now I think——

Mr. ROHRABACHER. Now with that said, one last point. What about this? Somebody dropped a satellite in this program. I haven't heard much about that. Did that—did the dropping of the satellite affect this program in any way?

Vice Admiral LAUTENBACHER. No, sir. That was a different program.

Mr. ROHRABACHER. It was a different program, but that did not affect this program?

Vice Admiral LAUTENBACHER. It did not affect this program.

Mr. ROHRABACHER. Okay.

Vice Admiral LAUTENBACHER. What we are talking about today did not involve that dropped satellite.

Mr. ROHRABACHER. All right. Well, I will accept that, but I won't accept the fact that we moved forward with a program based on assurances that technology would be there that is not there now.

Chairman BOEHLERT. Thank you very much for your always spirited interventions. And the new theme song for all of us, "Climb Every Mountain." But the good news is that there is light at the end of the tunnel, so to speak. We have got this critically important meeting on the 22nd. We have additional information. Everyone has sort of looked back and examined how we got here and is determined to extricate ourselves from this quagmire we are in right now. So that is good.

Mr. Calvert.

LESSONS LEARNED AND FUTURE PROGRAMS

Mr. CALVERT. Thank you, Mr. Chairman.

I just have a short period of time. I am running late for another appointment.

But I just wanted to carry on Mr. Rohrabacher's theme here on lessons learned from both the Admiral and Dr. Sega and from Dr. Livanos, the lessons learned and the experiences you have applied in all space programs. I know that—I also put on my other hat on the Armed Services Committee, I know that the Air Force is interested in getting into space which pertains to radar. And the last cost number I looked at just initial—just before we even really get into this, is about $35 billion. Is that about right, Dr. Sega?

Dr. SEGA. I have seen an estimate on a planned space radar program, but I want to—if I could, the approach that is laid out in the—in my opening statement is very specific to this. If you go to operational systems procurements, we should have material technologies. Also, it is in the developmental system, which is the next generation. And once it is mature, it can grow—it can evolve——

Mr. CALVERT. Well, and that is where I wanted to get to. We get into these programs where we are, obviously, dealing with technologies, sometimes, that, at best, is new and not tested yet, that we don't get into this situation down the road. Hopefully, through this experience, we are going to move it along, and we are going to get this fixed and get it operating—up and operating within the timeline that you need it. But how is this going to—going back to—how are we going to look at this—other programs that we are looking at down the road that are even more costly than what we are doing with here with NPOESS?

Dr. SEGA. I think being consistent with the approach that has the Nation investing, say, in four generations of technology, a science and technology base, advanced technology. That is where the risk should be. We should work off the risk and mature the technology in the developmental systems phase. When we commit to an operational systems procurement, we are starting with mature technologies. We are working on the integration, the manufacturing pieces, and understanding how it could be—how they will interface with the ground and the troops and so forth.

Mr. CALVERT. And that, obviously, is not what was done with NPOESS?

Dr. SEGA. To my understanding, that is correct.

Mr. CALVERT. So basically, this started wrong and it is ending wrong? Or the process is not going very well.

Dr. SEGA. Sir, I think it is fair to say, and others can comment here, that the technology needed to be matured prior to moving to advanced space integration.

Mr. CALVERT. Any other comments? Dr. Livanos.

Dr. LIVANOS. Yes, sir. I think we spend a substantial amount of time trying to figure out what—but more importantly, what lessons did we learn on how to properly manage the contracts and development. And we are preparing a short white paper that will communicate with other folks in the same arena, like Boeing and members of the staff here, what are those lessons learned, because we cannot afford to do them again. I think that, from—again, how to manage the subcontractor, there are four primary items here. First of all is we have got to make sure that when we talk about design maturity, that the standards are exactly the same with ourselves and what the subcontractor is stating. Secondly, we need to really examine the claims and we need to do that before the subcontractor starts. We need to really be very careful and dig deep on the schedule for development and understand that. And then finally, I think we need to look at, in detail, the DNA of the subcontractor. Do they have the same processes we do? Do they have the same heritage that we do? Do they basically follow up in the same way that we do? What exactly is contained in the critical design? So we need to know all of that, and I think, as I said, that this is a very painful lesson learned.

Mr. CALVERT. If I could, I don't know, this probably is not the most technically challenging thing that all of you have been involved in in your careers, I suspect. Is it or isn't it? Is this the most challenging technology that what we are trying to develop here that you have ever been involved in?

Dr. LIVANOS. Let us see. I think this is probably the one occasion where we had the most sensor development in one program.

Mr. CALVERT. The point is, what I am getting at, is if we move down the road involving these other programs, this kind of wakes everybody up here, I think, in this panel is that when we are dealing with our friends in the DOD as they move forward on some of these other programs, we are going to ask tough questions early on to make sure we don't end up where we are at today.

So with that, Mr. Chairman, thank you very much.

Chairman BOEHLERT. Thank you very much, Mr. Calvert.

Mr. Sodrel.

Mr. SODREL. Thank you, Mr. Chairman.

And I thank the panel members for being here today.

Along this same line, Admiral Lautenbacher, in the first of 2005, NOAA announced a new partnership with NASA for the next generation of NOAA geostationary satellites. I understand with recent advances in the space-based observing technology, we are pushing beyond weather and turning from the NOAA's GOES–R platform into a more encompassing environmental operational satellite that will benefit multiple sectors of the government. Now that goal sounds a lot like the goal we have here. And I guess my question is, given all of the problems that we currently have, is—the needs are multiple users on one satellite a good idea for going forward?

Vice Admiral LAUTENBACHER. I believe that it is, based on what we have done. We are taking the lessons learned. We have just had a milestone review with NOAA's GOES–R program. We have taken the lessons that we have learned from this NPOESS experience and applied them to both the schedule and the contracting methods and the program management setup. So all of the things that we will go through here today has things that we have found out by Monday morning quarterbacking has now been added into the NOAA's GOES–R program scheduled in the program costs. Our biggest issue is to try to keep it on schedule. Congress cut this program this year, and we are going to have an issue with trying to work on that as well. So we are going to be continuing to press to keep our money intact in order to ensure that we can deliver on the program. But I believe that the lessons we have learned from NPOESS, we are going to be looking at reasonable instrument development schedules and technologies, not ones that are going to be a significant challenge; ones that we can handle.

Mr. SODREL. Well, we already had some questions asked about the technology not being available, and I guess my follow-up question for each of you is if you had to have some priorities, either the priorities of the schedule or the priorities of the technology, there is some mature technology out here, it seems to me that part of the problem was no plan B. If we are going to stay on schedule, we may have to abandon the search for this new technology and use something that is more mature in order to stay on schedule. Was there no plan in place that we would use some mature technology in the event that this was not developed on the schedule?

Vice Admiral LAUTENBACHER. Again, I was not here at the beginning of the program, but knowing what I know about the system and looking at how it was constructed, take away the Monday morning quarterbacking, the folks at that time that looked at this did their best to try to assess the availability of the technology and whether it was doable in that sense. They added a risk reduction piece. We are adding more in NOAA's GOES–R. It obviously was not enough. They looked at it—at management structure that obviously didn't do what it was supposed to do. We are changing that. They were people who were working their hardest, I assure you, to try to deliver this. They were not people who were trying to sabotage this program or not be able to deliver on time. As far as I am concerned, my issue with those is that we have to make the timelines on those, and I am willing to look at part of the technology, because we have to have continuing geostationary coverage,

and that is where I am at in the management of the next satellite program, which is a geostationary one.

Mr. SODREL. Dr. Sega, would you like to follow up on that?

Dr. SEGA. Congressman, perhaps you reverse what we consider a plan A and a plan B, with the plan B being what we know, especially in satellites where we can forward a capability gap. And plan B is the higher end solution that if it matures in time, it can spiral into the baseline system.

Dr. LIVANOS. I can restrict my remarks on the NPOESS satellite, sir.

The satellite itself is a requirement for 55 types of things that it has to deliver. We are currently looking—we meet 50 of those. We are currently looking at how maybe we can change the nature of some of the sensors, not deliver the 55, but just 50 so that it would be good enough for the mission. Those are some of the options we are looking at. So we are not looking at the new instrument, but we are looking at changing the performance of some of the leftover instruments, two specifically, and see if it can accommodate the mission. We are working with the Integrated Program Office.

Mr. SODREL. Thank you.

Thank you, Mr. Chairman.

Chairman BOEHLERT. Thank you.

The Chair will recognize Mr. Gordon. He has one brief question, and then the Chair will try to sum up where I think we are.

POSSIBLE SUPPLEMENTAL REQUEST

Mr. GORDON. Thank you, Mr. Chairman.

I think one thing that we have learned today is that there is a lot that we don't know. But there are some things that we do know. We do know that this is a program in crisis, as Mr. Powner said, that—we do know that taxpayer dollars are at risk. We do know that there is a gap in satellite coverage that will almost inevitably lead to loss of lives and loss of, probably, also dollars lost, whether it is damages or what might happen. I think we know that the sooner that we start on a new plan, the more likely that we are going to avoid having that gap. And we do know that you are going to try to make a decision on a plan toward the end of this year, although that roll-out and renegotiating contracts and all of the other things will, whether they are intentional or unintentional, leads us almost to the 2008 fiscal year. And I think that we also know that the sooner that we get started on a program like this, the more money that we can save in the life cycle.

So with that sort of a premise, I would like to ask, and suggest also, that as you look at this plan that you are going to receive and decide by the end of the year, that again there has got to be lots of roll-outs. But hopefully there will be some elements of it, particular sensors or whatever, that can be started now and can be done simultaneously to the final roll-out. And if that occurs, and if you find that you do not have the funds to do that, I would like to ask whether you would ask for a supplemental or it be part of the supplemental, to get the funds to do these simultaneous programs that could save lives and dollars in the long run.

We will start with Admiral Lautenbacher and then Dr. Sega, please.

Vice Admiral LAUTENBACHER. I would most definitely entertain a supplemental——

Mr. GORDON. Would you—I mean, I know you would take it, but would you request a supplemental?

Vice Admiral LAUTENBACHER. I certainly would——

Mr. GORDON. Okay. And Dr. Sega?

Vice Admiral LAUTENBACHER.—if it were required, I would do that.

Mr. GORDON. When you say, now, required——

Vice Admiral LAUTENBACHER. I don't want to say I am going to—before I even look at the options to say that I am going to commit to request a supplemental. I want to look at the options first. But I have no hesitation, and I haven't had it previously.

Mr. GORDON. Dr. Sega.

Dr. SEGA. Sir, we will request the resources to get the job done.

Mr. GORDON. Sir?

Dr. SEGA. We will request the resources to get the job done.

Mr. GORDON. Would you request a supplemental?

Dr. SEGA. If necessary, if that is what it takes to get the job done.

Mr. GORDON. Thank you.

CLOSING REMARKS

Chairman BOEHLERT. Thank you very much.

Now let me give you my take on—and so often is the case with Mr. Gordon and the Chair, our remarks sometimes are interchangeable. If you read the transcript without identifying the author of the remarks, you wouldn't know which one. But that is because we are on the same wavelength in so many instances on this committee, and that is one of the reasons why I so dearly cherish this assignment is because this committee does work on a bipartisan basis. That isn't always on other Committees of this Congress in this atmosphere, but in this one, we pride ourselves on that.

All right. Here is where I think we are.

First, this committee, on both sides of the aisle, is obviously extremely concerned about how the NPOESS program has been run and where it is going. And we are going to intensify our oversight on it. Second, this committee expects, or perhaps I should say demands, full information about the options being considered from NPOESS before a final decision is made. That means we expect to get the documents in our request letter, and I think we have every right to expect that. And we expect to see the IPA and CAIG results very shortly after you review them. And finally, we are not urging at this time that funds be added in fiscal year 2006 or 2007, but we do think that the burden of proof is on the agencies to show why it is wise not to add those funds. If it looks like you need to slow things up to prevent further technical problems, then that decision needs to be stated clearly with a clear statement of the remaining technical risks and a clear statement of the costs and delays that will result.

We need to move forward as partners. Let me stress that. We need to move forward as partners with full explanations and shar-

ing of information. We are going to continue to keep our eye on the ball.

Thank you very much.

This hearing is adjourned.

[Whereupon, at 12:09 p.m., the Committee was adjourned.]

Appendix:

Answers to Post-Hearing Questions

ANSWERS TO POST-HEARING QUESTIONS

Responses by Vice Admiral Conrad C. Lautenbacher, Jr. (Ret.), Administrator, National Oceanic and Atmospheric Administration (NOAA)

Questions submitted by the Majority

Q1. On November 18, the Department of Defense announced that Northrop Grumman Space and Mission Systems Corporation was awarded a $12 million contract modification to transfer responsibility for part of the Conical Scanning Microwave Imager (CMIS) sensor from Boeing to Northrop Grumman. Please explain why this change was made. How will it help reduce technical and schedule risk- associated with the CMIS sensor? Under the contract modification, what aspects of the CMIS sensor remain Boeing's responsibility and what aspects are Northrop Grumman's responsibility? Do you anticipate further contract modifications for CMIS?

A1. This contract modification for the Conical Scanning Microwave Imager Sounder (CMIS) changed some responsibilities in the program that will streamline the design process. The change transferred the CMIS momentum wheel compensation responsibility from Boeing Satellite System (BSS) to Northrop Grumman Space Technology (NGST). The NPOESS satellite design includes a large spinning reflector as part of the CMIS sensor. The momentum wheels compensate for the torque and momentum applied to the spacecraft. The contract previously required Boeing to supply the wheels as part of the CMIS. Sensor analysis showed that the spacecraft attitude control subsystem, a NGST task, could provide the necessary compensation, therefore responsibilities were realigned. No additional contract modifications are anticipated for the CMIS Sensor.

Q2. The National Polar-orbiting Operational Environmental Satellite System (NPOESS) Independent Program Assessment found that, while there is major sensor testing planned for Fiscal Year (FY) 06, there are no management reserves to cover potential problems in FY06. How will you deal with any problems discovered during the major tests if there is no reserve funding? If necessary, would you request reprogramming of funds from other programs?

A2. The NPOESS Integrated Program Office (IPO) and Northrop Grumman Space Technology (NGST) have an agreed-to scope of activities for FY 2006 that can be accomplished within appropriated funding levels. The change in design philosophy for the Visible/Infrared Imager/Radiometer Suite (VIIRS), from concurrent development to serial development, will allow the NPOESS program to internally reallocate funding to meet its most pressing development tasks and still carry out the replanned FY 2006 NPOESS development program. These NPOESS tasks include a minimum level of management reserve to address typical problems that may occur in testing. We will reassess the required FY 2006 funding during the restructuring and certification efforts.

Q3. The NPOESS Executive Committee (EXCOM) met on November 22 to consider a number of options for reconfiguring the NPOESS program. What guidance did the EXCOM provide to the Tri-Agency Steering Committee, Integrated Program Office, and the Independent Program Assessment to develop these options? When and in what form was that guidance provided? What criteria did the EXCOM apply in choosing which option or options to pursue? What other decisions were made at the EXCOM meeting?

A3. At its August 19, 2005 meeting, the EXCOM directed the establishment of an Independent Program Assessment (IPA) which would be led by the U.S. Air Force. The IPA would undertake a complete independent review of the NPOESS program, including technical, cost, management, organization and policy. The EXCOM did not provide specific guidance or selection criteria for the IPA to use in developing options. The EXCOM also directed Department of Defense's Cost Analysis Improvement Group (CAIG) to review the NPOESS program.

At the October 13, 2005 meeting, the EXCOM received an update from the IPA on three intermediate options that it had developed. The IPA stated its intention to develop several more options and the EXCOM agreed. Although there was considerable discussion between the EXCOM and the IPA, no specific guidance was provided by the EXCOM to the IPA regarding the options or criteria for choosing options.

At their November 22, 2005 meeting, the EXCOM accepted four options for further costing. The Independent Program Assessment team (IPA) and the Triagency

Steering Committee (TSC) were not further instructed to develop these options. The EXCOM gave verbal direction to the Cost Analysis Improvement Group (CAIG) to provide cost estimates for the four options selected. Once these cost estimates are completed, program alternatives can be weighed and the program restructured, if appropriate. The EXCOM did not provide specific criteria to apply in choosing options.

Further EXCOM decisions taken at the November 22 meeting include:

- Determine best way to establish a Program Executive Officer (PEO) structure
  — Brigadier General select Mashiko as PEO
- Strengthen Integrated Program Office (IPO) Staffing
- Place a Senior User Advisory Group (SUAG) representative within the PEO Staff
- IPO should engage with Naval Research Laboratory (NRL) to investigate Windsat
- Cost the four options at the 80 percent confidence level
- Departments of Defense and Commerce brief Congress on the Nunn-McCurdy breach, process, timeline
- TSC/IPO should develop a strategic plan for U.S. environmental sensing, including technology development

Q4. Please explain what changes, if any, NOAA has made or will make to the program developing the next generation of geostationary satellites, GOES–R, based on each of these lessons learned from the NPOESS program:

Q4a. Mr. Powner's testimony explained that seven of the 13 sensors on NPOESS are new technology. Dr. Sega's testimony outlined a concept for future satellite programs in which technology would first be proven on research satellites and then integrated into operational platforms. Will you use only previously proven technology on GOES–R, or will it include new technology in its sensors?

A4a. While the GOES–R sensors are based on proven technology, the sensors will be technologically more advanced and possess improvements and new capabilities responsive to user requirements.

The Advanced Baseline Imager (ABI), Solar Environment in Situ Suite (SEISS), Solar Imaging Suite (SIS), and Hyperspectral Environmental Suite (HES) Program Definition and Risk Reduction (PDRR) activities all started prior to the GOES–R System PDRR. The Geostationary Lightning Mapper (GLM) PDRR is projected to start in early 2006. All instrument development schedules have sufficient margin to allow for resolution of problems. Of these instruments, the HES is the most challenging, and reviews are on-going to examine the risks and develop mitigation strategies.

Numerous review efforts will take place during the GOES–R System PDRR phase to ensure that program risks, including technology maturation and application are properly identified, managed, and reflected in contractor and Government cost and schedule estimates and in the budget. We also plan to form a GOES–R Independent Review Team consisting of senior space program experts, to probe technology readiness, with emphasis on the instrument suites.

Q4b. In the NPOESS program, the critical design review for the Visible/Infrared Imager Radiometer Suite (VIIRS) was conducted without building a full engineering design unit. Will you require more rigorous critical design reviews in GOES–R? If so, please outline the requirements you plan to use for GOES–R critical design reviews.

A4b. Yes, for GOES–R we will require more rigorous design reviews. Both the Advanced Baseline Imager (ABI) and the Hyperspectral Suite (HES) developments will include an Engineering Development Unit (EDU), as well as engineering models of critical components.

Engineering models will be developed for each instrument in the SIS, and for each instrument in SEISS. We are evaluating if an EDU is required for the GLM. This sensor has yet to enter the PDRR phase. As the concept matures, we will make a decision.

For on-going instrument development, the GOES–R Program is utilizing the NASA Goddard Space Flight Center (GSFC) Office of Systems Safety and Mission Assurance, Systems Review Office guidelines and is adhering to all NASA and NASA GSFC technical, management, safety, and mission assurance processes.

The specific guidelines for critical design reviews (CDR) include the requirement that the CDR be held near the completion of an engineering model, if applicable,

or the end of the breadboard development stage. This will be prior to any design freeze and before any significant fabrication activity begins. The CDR presents a final detailed design using substantially completed drawings, analyses and breadboard/engineering model evaluation testing to show that the design will meet the final performance and interface specifications and the required design objectives. The CDR should represent a complete and comprehensive presentation of the entire design. For the CDR, as well as the other major design milestones, there are detailed checklists of the information and analyses that must be presented to successfully complete the milestone and progress further. The acceptability of the data and analysis presented by the contractor for the milestone is assessed against the requirements through internal peer and external reviews.

Finally, the GOES–R Independent Review Team, a group of senior space program experts, will assess GOES–R execution status on an annual basis and will be available for *ad hoc* reviews as requested by NOAA management. The adequacy of design milestone criteria and accomplishment will also be a part of NASA GSFC monthly management reviews of the flight project, and a part of the proposed NOAA Program Management Council monthly management reviews.

Q4c. Contractor bids typically assume a 50 percent confidence level that the bid price is achievable. The NPOESS EXCOM directed that future cost estimates should be at an 80 percent confidence level. What confidence level will NOAA require for bids for the GOES–R contract?

A4c. The budget for GOES–R will be established at a confidence level consistent with the degree of programmatic risk. We will establish this level based on the knowledge gained during PDRR from the contractors' and Government risk and cost assessments. The Request for Proposal (RFP) for the GOES–R System Acquisition and Operations (A&O) contract will not be developed until summer 2006. Our preliminary plan is to request the contractors to identify the confidence level associated with their offer and to also provide two other confidence percentiles associated with their offer. This information will be used to support an assessment of the degree of risk that the contractors' bids represent.

Q5. In your testimony, you stated that you believe the technical issues with two of the problematic instruments for NPOESS, CMIS and VIIRS, "are being resolved." You also said that NOAA is "incorporating lessons learned from VIIRS into our management approach to CMIS." Please explain more specifically what technical issues remain and what lessons learned from VIIRS are being incorporated into NPOESS program management processes.

A5. IPO and NGST have implemented a number of management, design review, and test technological lessons learned from the experience with VIIRS to address the remaining issues related to CMIS. These include assembling tiger teams to address engineering challenges; tracking project management using earned value management techniques; directing management changes and improved staffing to ensure the appropriate skills are matched to the job; enhancing quality assurance by the contractor; increasing the physical presence of IPO and NGST personnel at contractor work sites; and conducting additional independent reviews, and flight unit integration and test after the Engineering Development Unit integration and test is complete.

The critical sensor issues occurred with the instrument subcontractors. To correct these problems, Northrop Grumman Space Technology (NGST), the prime contractor, worked with the instrument manufacturers and their suppliers in resolving underlying failures, including conducting extensive audits of these suppliers and has intervened to improve their program execution. These methods of handling suppliers have been institutionalized within the NPOESS program and should serve to mitigate any future design problems. Two lessons learned from VIIRS are that (1) a serial design philosophy instead of a concurrent one is more appropriate, and (2) more intense government oversight is required of prime and sub-contractors.

Q6. In his testimony, Dr. Livanos said, "The satellite itself has a requirement for 55 types of things that it has to deliver. We are currently looking at how we can meet 50 of those." Are the users of NPOESS data being consulted as part of this look at decreasing the number of requirements for NPOESS? If so, please explain the process by which the users are included or consulted with about decisions regarding requirement changes. If you have consulted with users, what options do they favor and what are their primary concerns about cutting back from 55 to 50 environmental data records?

A6. The NPOESS user community is represented by the Senior Users Advisory Group (SUAG). The SUAG is represented in the Nunn-McCurdy process. As part of

this process, they will have significant input concerning the future status of the 55 environmental data records selected for the NPOESS program.

Q7. Some of the options under consideration for moving forward with NPOESS would result in one polar orbit being covered by European satellites. What would be the impact to NOAA's weather forecasting capabilities if there were no U.S. civilian satellite or no satellite at all in one of the polar orbits? How can we be sure the European satellites will be ready in time and be compatible with our weather forecast models?

A7. NOAA's National Weather Service and other users require twice daily global coverage from at least two polar-orbiting platforms. Compared to a two polar-orbiting system, a single polar-orbiting platform operating in the prime afternoon orbit is estimated to degrade global weather forecasts by 10 percent. If all polar-orbiting satellites fail, the loss in forecasting capability would be 25 percent in the Northern Hemisphere and 60 percent in the Southern Hemisphere. In 1998, NOAA and the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) signed an agreement to share responsibilities for the polar-orbiting operational environmental satellite mission. Under this agreement, EUMETSAT will assume responsibilities for the mid-morning orbit while NOAA will maintain its capabilities in the afternoon orbit. EUMETSAT is building three polar-orbiting satellites that will carry current NOAA instruments as well as new European instruments. The first of these satellites is already built and is scheduled to be launched and operational by the end of 2006. These three satellites will provide service in the mid-morning polar orbit through 2020. Under the agreement, NOAA will have access to data and products from the European satellites for use in our weather forecast models. In that the EUMETSAT satellites will have NOAA instruments, we know that the data from these instruments will be compatible with our weather forecast models. In addition, we are working with EUMETSAT to ensure that data from their new instruments will be compatible with our models.

Q8. Mr. Powner said in his testimony that an independent review of the problems plaguing the NPOESS program was delivered to the government in August 2005. According to Mr. Powner, that report said that the NPOESS program management office did not have the technical system engineering support it needed to effectively manage the contractor. What changes have you made or will you make to fix this problem?

A8. Systems engineering is the centerpiece of our organizational restructuring efforts and will remain a focal point for the completion of the NPOESS design. A position for an experienced Systems Engineering Manager for NPOESS and NPOESS Preparatory Project has been established. A complement of staff with the necessary skills to perform systems engineering, monitor the development of the spacecraft, payloads, algorithms, and missions operations has been proposed and is being planned. The pending realignment of the IPO and of Northrop Grumman Space technology (NGST) increases systems engineering capability.

Q9. If the last of NOAA's current series of polar satellites fails, there could be up to a three-year polar-satellite coverage gap. What outreach activities has NOAA conducted to alert international organizations, such as the World Meteorological Organizations and the countries participating the Global Earth Observing System of Systems (GEOSS), that NPOESS will be delayed and that a gap in polar-orbiting data may result?

A9. We are still assessing whether there could be a gap in polar satellite service. If we determine that there could be a gap, we will undertake appropriate outreach activities with national and international users and partners.

We plan to reduce the likelihood of a gap between the POES and NPOESS satellites by delaying the launch of NOAA–N Prime by at least one year. Should this satellite fail, we will have to rely on capabilities from older on-orbit satellites. We would also accelerate the use of data from the NPOESS Preparatory Project (NPP) mission for operational weather forecasting, in addition to its climate mission and risk reduction missions.

In addition, we will use data and products from the European series of polar orbiting satellites, which are scheduled to be operational by the end of 2006. We expect these satellites will provide service in the mid-morning polar orbit through 2020.

Questions submitted by the Minority

Q1. At the time of the hearing, the Nunn-McCurdy threshold of 15 percent cost overrun for the NPOESS program had been reached. A Department of Defense press release issued on November 15 included an estimate of the overrun of 21.8 percent. In your testimony, you indicated an expected cost overrun of "at least" 15 percent. We now know the NPOESS program has exceeded the 25 percent level. Why did you not inform the Committee during the hearing that a possibility existed for the 25 percent threshold to be reached—a situation that would prevent you or Dr. Sega from providing assurances about the Executive Committee's ability to move forward on a decision plan for the NPOESS program in December?

A1. The November 15, 2005 Department of Defense press release detailed major defense acquisition program cost and schedule changes since the June 2005 reporting period. This information is based on the Selected Acquisition Reports (SARs) submitted to the Congress for the September 30, 2005, reporting period. SARs summarize the latest estimates of cost, schedule, and technical status. Subsequent quarterly exception reports are required only for those programs experiencing unit cost increases of at least 15 percent or schedule delays of at least six months. Quarterly SARs are also submitted for initial reports, final reports, and for programs that are re-baselined at major milestone decisions. The NPOESS Program was one of several programs in the report.

At the time of the November 16, 2005 hearing, NOAA had not been informed that the 25 percent threshold would be exceeded. Our first official notice that the threshold would be exceeded came from the Department of Defense's Cost Analysis Improvement Group's (CAIG) report to the NPOESS Executive Committee on November 22, 2005.

Upon review of the CAIG estimate, the NPOESS Program Director issued a program deviation report on November 30, 2005. The Committee's staff was provided with a copy of the CAIG's assessment that a 25 percent breach would occur on December 8, 2005. On January 12, 2006, the Secretary of the Air Force notified Congress he had reasonable cause to believe that the 25 percent threshold would be exceeded. A Nunn-McCurdy certification process is now underway.

Q2. The original Memorandum of Understanding between DOD, NOAA, and NASA did not anticipate the requirements imposed on DOD by a Nunn-McCurdy breach of cost thresholds. What contingencies is NOAA exploring if DOD decides it cannot certify the NPOESS program and therefore withdraws its participation in NPOESS? If DOD does decide to withdraw from the program, would NOAA and NASA proceed with the NPOESS program? What procedures and funding would be required for NOAA to purchase additional POES-series satellites?

A2. We are hopeful that the program will proceed as planned and restructured by the Nunn-McCurdy process with the Department of Defense (DOD) as an integral part of the program. Should DOD withdraw from the program, then NOAA would need to determine the most cost-effective solution to satisfy its requirements whether it is NPOESS or some other alternative. Because of this potential risk, NOAA is exploring options, such as the development of Polar-orbiting Operational Environmental Satellites (POES)-like satellites, in the event it would need to proceed by itself.

Q3. How much of the currently budgeted FY 2006 and FY 2007 funding is available for reprogramming within the NPOESS program by changing the VIIRS development approach from concurrent development to serial development?

A3. Between changing the VIIRS development approach from concurrent development to serial development and other prudent program allocations, the Integrated Program Office in working with Northrop Grumman Space Technology was able to keep NPOESS's development on track and within the FY 2006 budget. This includes providing additional resources for the development of the CMIS sensor.

Q4. You and Dr. Sega both discussed the EXCOM's interest in better assessing and reducing the technical, financial and schedule risks of the NPOESS program. Has the EXCOM received or requested an analysis of the integration risks? Are the current options and plans for NPOESS based solely upon the risks associated with the development of the individual sensors or has integration risk been incorporated as well?

A4. The EXCOM has been briefed about integration risks by the IPO, the Cost Analysis Improvement Group (CAIG), and the Independent Program Assessment (IPA). An analysis of overall program risks will be part of the Nunn-McCurdy proc-

ess. Integration risk has been consistently addressed in the program and is considered and highlighted in the Risk Management process employed on the program. The decision to use a serial design process reduces integration risk by including additional testbed work.

Q5. What are the ramifications for the NPOESS program if the Nunn-McCurdy certification process results in a finding that the NPOESS system is essential to the national security with respect to data availability to NOAA and other civilian users and with respect to NOAA's international data sharing agreements, and for the current technical and software specifications of the NPOESS system?

A5. The NPOESS program was established in 1995 with the requirement that the data it provides satisfy both military and civil environmental data requirements and remain free and open to national and international users, except in times of national emergency as dictated by the U.S. National Command Authority. A Nunn-McCurdy certification that NPOESS is essential to national security will not affect data availability to the civil user community.

Being essential to national security is different than being part of the national security system which: (a) involves intelligence activities; (b) involves cryptologic activities related to national security; (c) involves command and control of military forces; (d) involves equipment that is an integral part of a weapon or weapon system; or (e) is critical to the direct fulfillment of military or intelligence missions.

Q6. The Committee learned from the contractor for the NPOESS project that a specific briefing on cost and schedule was given to the IPO on March 31, 2005. That briefing was given by Northrop Grumman employees who flew to Washington and briefed IPO staff in the staff offices in Silver Spring, Maryland.

Committee staff have reviewed copies of the monthly reports that were provided by the contractor to the IPO for the half year prior to this briefing. Those materials gave ample warning of profound cost and schedule problems in three central instruments necessary for the success of this program (VIIRS, CMIS, OMPS). In light of this documentary trail, staff find it hard to understand how the March 31 briefing could have been a surprise to anyone involved with the management of the program. Certainly the visit itself by Northrop Grumman was not a surprise but appears to have been something that was arranged and discussed among IPO and Northrop Grumman staff for at least a couple of weeks prior to the briefing (based on e-mail traffic provided by Northrop Grumman).

Please provide a specific indication of when, by what means and from which individual each of the following individuals learned that Northrop Grumman was indicating they could not maintain the cost and schedule baseline. Also indicate when each of the following individuals learned that Northrop Grumman had prepared three scenarios for discussion at the March 31 briefing and the general slip in schedule and cost growth associated with those options.

a. Mr. John Cunningham

b. Mr. Greg Withee

c. General John Kelly

d. Admiral Conrad Lautenbacher

A6. All NPOESS EXCOM and Triagency Steering Committee (TSC) members knew of the development problems in the NPOESS instruments in Fall 2004. In January 2005, the EXCOM instructed the TSC to establish an independent review team (IRT) to give the Government independent advice on these problems. However, IPO and the contractor responded to repeated questions by the EXCOM and TSC members as to the impact of these problems on overall NPOESS cost and schedule by maintaining that, although delivery of NPOESS instruments to the NPP satellite had slipped and were exerting significant pressure on the FY 2005 and FY 2006 budget, launch of the first NPOESS satellite remained within cost and schedule.

On March 16, 2005, the TSC visited the Northrop Grumman Space Technology site and asked, the same question regarding the overall impact of the sensor problems to the NPOESS cost and schedule. The contractor stated that, although the delivery of NPOESS instruments to the NPP satellite had slipped and were exerting pressures on the FY 2005 and 2006 budgets, the launch of the first NPOESS satellite remained on schedule.

With respect to when the following individuals learned that Northrop Grumman was indicating it could not maintain the cost and schedule baseline:

a. We do not know exactly when Mr. John Cunningham first learned this information; he has since left Government service;

b. Mr. Greg Withee learned from voice communication from John Cunningham early in the first week of April 2005;

c. General John Kelly learned from voice communication from Mr. Greg Withee in the first two weeks of April 2005;

d. Admiral Conrad Lautenbacher learned from voice communication from Mr. Greg Withee in the first two weeks of April 2005.

Scenarios were presented to the TSC on April 19, 2005. There was no discussion that these were the same scenarios as in the March 31 briefing. The March 31 briefing was finally sent to Mr. Greg Withee in the summer 2005, and soon after discussed with General John Kelly and Admiral Lautenbacher.

Q7. In the weeks and months following the March 31 briefing, the IPO was placed in charge of overseeing the development of scenarios to find the optimal combination of minimizing schedule slip at the least cost. The IPO, in turn, relied upon Northrop Grumman to develop those options with more specific information. The IPO would present options to the Tri-Agency Steering Committee (TSC). We know there were presentations to the TSC in April and May. Finally, the Executive Committee met on August 19, 2005 with an intention to provide some direction to the program. The decision of the EXCOM was to ask for outside review of four options. Four and a half months passed between the March 31 briefing and the first meeting of the EXCOM.

Q7a. During those four-and-a-half months the IPO made representations to the TSC about the need for speed in receiving guidance from the EXCOM. Please provide a list of items that the IPO asked the TSC to move up the decision chain and indicate which of those issues were communicated to the EXCOM, or its officials, and the means by which these communications occurred.

A7a. During the four and one-half months after March 31 the Tri-Agency Steering Committee examined a range of options. As the IPO and Northrop Grumman Space Technology (NGST) investigated the options, variations were identified that represented increased knowledge of the problem. As a result, cost estimates were growing and schedules were slipping. Neither the IPO nor the contractor could provide consistent cost and schedule estimates for the program; thus the estimates and information were not deemed credible and the action items in the IPO presentations were not followed.

In July 2005 the TSC thought the estimates had firmed and scheduled an EXCOM. On August 11 John Cunningham briefed General Kelly and Mr. Greg Withee that, with the inclusion of more detailed subcontractor estimates, the estimates had changed again and were significantly higher than set previous estimates. At the EXCOM meeting, which was held a week later, it was decided to call in another review team to examine the total program, and provide independent cost and schedule assessments.

Q7b. Please explain how communications between John Cunningham and General Kelly occurred between March 31 and August 19.

A7b. Communications between General Kelly and John Cunningham were primarily through TSC meetings and pre-briefs for these meetings. Additional communications included e-mails and the monthly EXCOM reports from Mr. Cunningham to members of the TSC and EXCOM.

Q7c. Both in private meetings with Members and staff, and in the hearing record, there has been an effort to explain that the IPO's work was not viewed as entirely reliable on cost and schedule issues. It is unclear whether this is due to the staffing mix at the IPO lacking adequate cost estimating resources, the personnel involved, or some combination of these issues (or other issues yet to be raised). Please clarify why the IPO was not viewed as a reliable source of information. If that was the view of NOAA senior management, clarify when and how this view emerged. Further, please clarify why NOAA senior management waited so long to seek outside advice if the IPO was not viewed as a reliable source of information. Admiral Lautenbacher, General Kelly and Greg Withee may have differing views on these issues and we ask that each be allowed to provide their own perspective if there are differences in response to this issue.

A7c. The IPO provided rough cost and schedule estimates that were constructed primarily by a top-down management estimate for the effort required to make the program executable. IPO cost and schedule estimates continued to change during the

spring and summer of 2005. At its August 16 meeting, the Tri-Agency Steering Committee (TSC) believed an additional independent estimate was necessary to raise the confidence level of the options it was reviewing. The EXCOM concurred at its August 19, 2005 meeting.

Q7d. Please provide a clear explanation of the role of the TSC in managing NPOESS. It stood between the formal, interagency managerial body, the Executive Committee, and the interagency project management office, the IPO. What exactly did the TSC do?

A7d. The TSC was created to serve as a tri-agency issue coordination forum to facilitate streamlined decision-making by the EXCOM Principals. The TSC reviewed the status of the program, considered decisions necessary to program activity, and referred issues with recommendations to the EXCOM.

Question submitted by Representative Jim Costa

Q1. Dr. Livanos's testimony states: "We have a lot of work to do to improve the technical capability and operability of three of our sensor packages, but we know how to do this and work is under way. We have provided more than 30 different scenarios to our government customers on the critical path forward, optimizing cost and schedule considerations." However, there is no mention of spacecraft issues (e.g., bus design, launch schedules, etc.) and how they will be impacted by the re-baselining of the program. What impacts will you expect resolution of the issues with the sensors and re-baselining of the NPOESS program to have on the portions of the program involving the spacecraft?

A1. The spacecraft has been impacted by the redirection of funds in FY 2006. Specifically, more funds are being used on NPOESS Preparatory Project (NPP) sensors and the Conical Scanning Microwave Imager/Sounder (CMIS). This will delay launch availability, but not impact the spacecraft bus design or ability to meet current requirements.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Ronald M. Sega, Under Secretary for the Air Force

Questions submitted by Chairman Sherwood L. Boehlert

CMIS

Q1. On November 18, the Department of Defense announced that Northrop Grumman Space and Mission Systems Corporation was awarded a $12 million contract modification to transfer responsibility for part of the Conical Scanning Microwave Imager (CMIS) sensor from Boeing to Northrop Grumman. Please explain why this change was made. How will it help reduce technical and schedule risk associated with the CMIS sensor? Under the contract modification, what aspects of the CMIS sensor remain Boeing's responsibility and what aspects are Northrop Grumman's responsibility? Do you anticipate further contract modifications for CMIS?

A1. This was a modification to the National Polar-orbiting Operating Environmental Satellite Systems (NPOESS), Acquisition and Operations Contract. The change transferred the Conical Scanning Microwave Imager Sounder (CMIS) momentum wheel compensation responsibility from Boeing Satellite System (BSS) to Northrop Grumman Space Technology. The NPOESS Satellite design includes a large spinning reflector as part of the CMIS sensor, requiring Momentum Wheel Assemblies (MWAs) to compensate for the torque and momentum applied to the spacecraft. The baseline design had Boeing Satellite supplying the MWAs as part of the CMIS Sensor. Trade studies revealed that if the spacecraft attitude control subsystem developed by Northrop Grumman performed momentum compensation for CMIS, then CMIS related anomalies would have lower impact on the overall mission performance.

NPOESS INDEPENDENT PROGRAM ASSESSMENT

Q2. The National Polar-Orbiting Operational Environmental Satellite System (NPOESS) Independent Program Assessment found that, while there is major sensor testing planned for Fiscal Year (FY) 06, there are no management reserves to cover potential problems in FY06. How will you deal with any problems discovered during the major tests if there is no reserve funding? If necessary, would you request reprogramming of funds from other programs?

A2. The program is presently evaluating several alternatives and implementing the recommendations of the Independent Program Assessment. The program office and Northrop Grumman Space Technology have recently established an agreed-to scope of activities for FY06 that is in concert with the appropriated funding and recommended confidence levels. These activities include a prudent level of management reserve to address problems that may occur. As part of the ongoing Nunn-McCurdy certification activities, we will reassess the required FY06 funding consistent with the program alternative chosen.

NPOESS EXECUTIVE COMMITTEE

Q3. The National Polar-orbiting Operational Environmental Satellite System (NPOESS) Executive Committee (EXCOM) met on November 22, to consider a number of options for reconfiguring the NPOESS program. What guidance did the EXCOM provide to the Tri-Agency Steering Committee, Integrated Program Office, and the Independent Program Assessment to develop these options? When and in what form was that guidance provided? What criteria did the EXCOM apply in choosing which option or options to pursue? What other decisions were made at the EXCOM meeting?

A3. The EXCOM provided verbal direction to the program office to consider four options provided by the Independent Program Assessment, and directed the Cost Analysis and Improvement Group (CAIG) to provide independent cost estimates for those options. The EXCOM also directed the program office to keep open other options that may merit additional consideration. Once the cost estimates are finished, program alternatives can be weighed and the program restructured. The EXCOM did not provide specific criteria to apply in choosing options and did not choose a replan option at this time. There were no other decisions made at the meeting concerning options or the restructuring of the program.

NPOESS, CMIS, & VIIRS

Q4. In his testimony, Admiral Lautenbacher stated that he believes the technical issues with two of the problematic instruments for National Polar-orbiting Operational Environmental Satellite System (NPOESS), Conical Microwave Imager Sounder (CMIS) and the Visible/Infrared Imager Radiometer Suite (VIIRS), "are being resolved." He said that National Oceanic and Atmospheric Administration (NOAA) is "incorporating lessons learned from VIIRS into our management approach to CMIS." Please explain more specifically what technical issues remain with CMIS and VIIRS and what lessons learned from VIIRS are being incorporated into CMIS and NPOESS program processes.

A4. The Visible/Infrared Imager Radiometer Suite (VIIRS) experienced issues with its telescope and with integrated circuits used in the focal planes. The Conical Microwave Imager Sounder (CMIS) development experienced integration and early subsystem test failures of key front-end receiver elements. As a lesson learned from the VIIRS development, CMIS development will proceed in a serial manner.

NPOESS USERS

Q5. In his testimony, Dr. Livanos said, "The satellite itself has a requirement for 55 types of things that it has to deliver. We are currently looking at how we can meet 50 of those." Are the users of National Polar-orbiting Operational Environmental Satellite System (NPOESS) data being consulted as part of this look at decreasing the number of requirements for NPOESS? If so, please explain the process by which the users are included or consulted with about decisions regarding requirement changes. If you have consulted with users, what options do they favor and what are their primary concerns about cutting back from 55 to 50 environmental data records?

A5. All requirements questions, especially those concerning the environmental data records, are brought to the attention of the Senior Users Advisory Group. This group of senior leaders from Department of Commerce (DOC), National Aeronautics 8s Space Administration (NASA), and the Department of Defense (DOD) is chaired by the Director of the National Weather Service. This group meets regularly to discuss program progress and the needs of the meteorological community. The Nunn-McCurdy process is examining a range of options regarding environmental data records.

NPOESS PROGRAM MANAGEMENT OFFICE

Q6. Mr. Powner said in his testimony that an independent review of the problems plaguing the National Polar-orbiting Operational Environmental Satellite System (NPOESS) program was delivered to the government in August 2005. According to Mr. Powner, that report said that the NPOESS program management office did not have the technical system engineering support it needed to effectively manage the contractor. What changes have you made or do you plan to make to fix this problem?

A6. The Integrated Program Office has completely restructured its management organization to strengthen the systems engineering effort for the program. Additional support will be added to the systems engineering organization in the future. All three agencies (National Oceanic and Atmospheric Administration (NOAA) , National Aeronautics 8y Space Administration (NASA), and the United States Air Force (USAF)) have committed to help staff the organization. A Chief Engineer position was created to handle major systems development problem areas and to ensure adequate attention is paid to each concern. A Mission Assurance shop with direct report to the NPOESS System Program Director will review program milestones to ensure readiness before passing major gates in the development and production areas.

NPOESS EXECUTIVE COMMITTEE

Q7. What do you see as the most difficult program management challenges for National Polar-orbiting Operational Environmental Satellite System (NPOESS) today and how are these being addressed by the NPOESS Executive Committee (EXCOM)?

A7. The most difficult program management challenge facing the NPOESS program is to keep the program progressing while the Nunn-McCurdy certification process and resulting decisions are in progress. The EXCOM has helped expedite the deci-

sion process. For Fiscal Year 2006, the work being done is fundamental to any of the NPOESS program replan options.

HIGH RISK PROGRAMS

Q8. Given the problems that the National Polar-orbiting Operational Environmental Satellite System (NPOESS) program has faced, do you believe the contract bid process for high-risk programs needs to be changed to ensure that initial bids and program baselines are based on an 80 percent confidence level and incorporate only previously proven technologies?

A8. The selection of a confidence level for program cost estimates is a program-specific decision. It should be tied to the risk that the agency is willing to take on the program and the appropriate level of technology maturity. However, as a matter of policy, I am pursuing a fundamental shift in space acquisition, embracing the Young Panel findings recommending that programs be funded to higher confidence levels whenever possible.

Questions submitted by Representative Bart Gordon

DMSP SATELLITES

Q1. The DMSP satellite series has been built by Lockheed Martin for DOD since the mid-1960's. If DOD required additional DMSP satellites to cover a schedule slip for NPOESS that extended beyond 2012, would it be possible to order additional DMSP satellites to overcome any potential DOD data gap?

A1. The DMSP production line was closed in August 1999. A study was completed in 2001 by the Space and Missiles Systems Center that examined the feasibility of producing additional DMSP satellites or a block upgrade of DMSP. The study concluded that the cost of development and production of additional. DMSPs was significant, with non-recurring costs increased by parts obsolescence. Design and retooling would also be required since DMSP is out of production. Further, additional parts have become obsolete, exacerbating the problem. However, we are exploring the possibility of a Service Life Extension Program (SLEP) for the remaining DMSP satellites that could extend the life of those satellites beyond 2012.

NPOESS SYSTEM

Q2. What are the ramifications for the NPOESS program if the Nunn-McCurdy certification process results in a finding that the NPOESS system is essential to the national security with respect to data availability to NOAA and other civilian users and with respect to NOAA's international data sharing agreements, and for the current technical and software specification of the NPOESS system?

A2. The NPOESS program was established in 1995 with the agreement that the data it provides support both military and civil environmental data products and be available to national and international users, except in times of crisis or war, as dictated by the U.S. National Command Authority. Therefore, there should be no adverse ramifications expected if the Nunn-McCurdy certification finds NPOESS is essential to national security.

NUNN–MCCURDY PROCESS

Q3. If the Nunn-McCurdy certification process results in a finding that the NPOESS system is not essential to the national security can DOD proceed with program under the statutory requirements of Nunn-McCurdy?

A3. To continue the obligation of funds, the Nunn-McCurdy statute requires the Under Secretary of Defense for Acquisition Technology and Logistics (USD(AT&L)) to submit to Congress a certification (with supporting explanation) that:

(i) such acquisition program is essential to the national security;

(ii) there are no alternatives to such acquisition program which will provide equal or greater military capability at less cost;

(iii) the new estimates of the program acquisition unit cost or procurement unit cost are reasonable; and

(iv) the management structure for the acquisition program is adequate to manage and control program acquisition unit cost or procurement unit cost. The USD(AT&L) makes his decision based on a number of inputs from across

the Department and, in the case of NPOESS, will also include inputs from Department of Commerce (NOAA) and NASA.

EXCOM

Q4. You and Admiral Lautenbacher both discussed the EXCOM's interest in better assessing and reducing the technical, financial and schedule risks of the NPOESS program. Has the EXCOM received or requested an analysis of the integration risks? Are the current options and plans for NPOESS based solely upon the risks associated with the development of the individual sensors or has integration risk been incorporated as well?

A4. Integration risk was an integral feature of the risk assessment provided to the EXCOM. Integration risk is also considered and highlighted in the Risk Management process employed on the program. Current options and plans include prudent measures for the mitigation of integration risk.

VIIRS

Q5. How much of the currently budgeted Fiscal Year (FY) 2006 and FY 2007 funding is available for reprogramming within the National Polar-orbiting Operational Environmental Satellite System (NPOESS) program by changing the Visible/Infrared Imager Radiometer Suite (VIIRS) development approach from concurrent development to serial development?

A5. The change from a concurrent to a serial approach did not reduce overarching funding for NPOESS in the FY 2006 and 2007 budget. The decision to move to serial development was done to reduce the risk inherent in a concurrent development. Of the funding that shifted, the NPOESS program internally reallocated the available funding to meet its most pressing development tasks identified by the Independent Program Assessment and to increase the opportunity for increased mission success.

Question submitted by Representative Jim Costa

Q1. Dr. Livanos's testimony states: "We have a lot of work to do to improve the technical capability and operability of three of our sensor packages, but we know how to do this and work is under way. We have provided more than 30 different scenarios to our government customers on the critical path forward, optimizing cost and schedule considerations." However, there is no mention of spacecraft issues (e.g., bus design, launch schedules, etc.) and how they will be impacted by the re-baselining of the program. What impacts will you expect resolution of the issues with the sensors and re-baselining of the NPOESS program to have on the portions of the program involving the spacecraft?

A1. It is anticipated that resolution of the sensor issues can be accomplished without major impact to the spacecraft. All options are viewed in light of their impact on the spacecraft and their effect on launch date. The re-baselining is anticipated to slip the launch date. The exact slip is dependent upon the option selected.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Alexis C. Livanos, President, Northrop Grumman Space Technology

Questions submitted by the Majority

Q1. On November 18, the Department of Defense announced that Northrop Grumman Space and Mission Systems Corporation was awarded a $12 million contract modification to transfer responsibility for part of the Conical Scanning Microwave Imager (CMIS) sensor from Boeing to Northrop Grumman. Please explain why this change was made. How will it help reduce technical and schedule risk associated with the CMIS sensor? Under the contract modification, what aspects of the CMIS sensor remain Boeing's responsibility and what aspects are Northrop Grumman's responsibility? Do you anticipate further contract modifications for CMIS?

A1. This contract modification transferred responsibility for CMIS momentum compensation from the CMIS instrument and Boeing to the NPOESS spacecraft and Northrop Grumman Space Technology. The CMIS instrument is a large spinning structure which generates torque and momentum that must be compensated for either in the instrument or on the spacecraft. In the baseline design, Momentum Wheel Assemblies within the CMIS instrument compensated for the torque and momentum generated by the instrument. Trade studies indicated that anomalies in CMIS control would have less impact on the spacecraft if compensation was provided by the spacecraft attitude control subsystem. CMIS momentum compensation was therefore transferred to the spacecraft to improve performance during a CMIS anomaly and reduce mission risk. The remainder of the CMIS instrument functions, including the Receiver Subsystem, Scan Control and Data Handling Subsystem, Antennas and Structures, and algorithm development, remain Boeing's responsibility. Although minor contract modifications to clarify interfaces may occur in the future, no significant contract modifications are anticipated.

Q2. In your testimony, you said, "The satellite itself has a requirement for 55 types of things that it has to deliver. We are currently looking at how we can meet 50 of those." Are the users of NPOESS data being consulted as part of this look at decreasing the number of requirements for NPOESS? If so, please explain the process by which the users are included or consulted in decisions regarding requirement changes. If you have consulted with users, what options do they favor and what are their primary concerns about cutting back from 55 to 50 environmental data records?

A2. NPOESS produces 55 Environmental Data Records (EDRs). Within these EDRs there are 1,598 attributes specified in the NPOESS System Specification and of these attributes, over 95 percent currently meet or exceed spec. Less than five percent do not. NGST is assessing hardware and software approaches to bring these attributes into compliance and does not plan to eliminate any EDRs. NGST will work in conjunction with the IPO, the user community, and through the formal program change control process to assess whether specifications can be modified or waivers granted for those attributes which cannot be brought into compliance. This process requires that trades and analyses be performed to define a recommended approach and an expected level of performance. The recommended approach will be reviewed and approved by the Change Control Board (CCB) prior to submittal to the IPO for review and approval. Users are consulted and their inputs incorporated in the trades and analyses leading to the recommended approach.

It should be noted that users are well represented on the program and are routinely included in NPOESS on-going activities. Potential changes in NPOESS capability or data quality are referred to the Senior Users Advisory Group (SUAG). This group is chaired by the Director of the National Weather Service and staffed with senior user representatives from DOC, DOD, and NASA. Users also participate from time to time in the program Integrated Product Teams and were participants in the delta Preliminary Design Review held this summer. User forums are also held routinely with the Centrals, Operational Algorithm Teams (OATS) and science users, and with the direct read-out users.

Q3. While the direction of the NPOESS program is uncertain, what is Northrop Grumman Space Technology doing to ensure the company maintains the "A-team" of highly qualified people (many of whom have only recently been put in place due to personnel changes in response to NPOESS cost and schedule issues) at Northrop Grumman and at the NPOESS subcontractors?

A3. Members of the Northrop Grumman Space Technology (NGST) leadership team are highly motivated to resolve issues on the program and deliver this important national mission to the country. They are also part of NGST's formal incentive compensation program, which provides incentive bonuses and restricted stock units for meeting program and organization objectives. Incentive awards are based on program performance, and each participant has specific goals aligned with the program objectives—to include keeping the NPOESS team intact and assuring operating efficiency. NGST has also been able to strengthen its NPOESS management team by adding key management, notably to the Program Office, Space Segment and Payload teams.

Subcontractors have similar incentive plans in place, and on a case by case basis, some subcontractors have individualized incentive plans for key personnel. In addition, the NGST NPOESS program office has specific employee incentive programs in place at some of the key subcontractors. At Raytheon Santa Barbara Remote Sensing, an employee incentive plan has been established to support delivery of the VIIRS instrument. This plan rewards timely delivery of a high quality product and is structured to motivate employees to remain on the NPOESS program. To date, the attrition rate on the NPOESS program has been low and consistent with other programs at NGST.

Q4. Northrop Grumman Space Technology participated in the government's Critical Design Review (CDR) for the Visible/Infrared Imager Radiometer Suite (VIIRS) sensor. VIIRS is a developmental sensor with much new technology, yet the CDR did not include a full engineering design unit. Given the nature of the CDR, why didn't Northrop Grumman require more rigorous review of VIIRS after the company assumed responsibility for the VIIRS sensors development? And given the limitations of the VIIRS review and Raytheon Santa Barbara's limited experience building operations sensors, why wasn't Northrop Grumman's oversight of the subcontract more rigorous?

A4. When Northrop Grumman Space Technology (NGST) first took over responsibility for the VIIRS subcontract, there was no evidence to suggest that a rigorous review was needed. Santa Barbara Remote Sensing's (SBRS's) performance under the Government contract that had been ongoing for several years had been satisfactory and there was a claim of strong heritage to the MODIS instrument. SBRS also enjoyed a very favorable reputation in the industry at that time. Unfortunately, NGST was unaware of the significant erosion of talent that had occurred at SBRS.

The impact of not performing a rigorous review when taking over responsibility for VIIRS has revealed a short-coming in our subcontract management practices and is a lesson learned. As a result, I have directed NGST to institute the practice of performing subcontractor capability assessments of any development activity transferred to NGST. I have also directed that NGST audit the criteria, analysis, products, and action closure of the last major gate review of any development subcontract transferred to NGST. If the review process and products are inadequate, the review will be repeated. Repeating this review will assure the product is as mature as claimed, that the thoroughness of processes employed is adequate, that sufficient analyses support the design, and that documentation is complete. This repeated review, coupled with the capability audits, technical assessments, and executability reviews will allow NGST to best match the technical talent assigned to the subcontract management teams with our subcontractor's needs and ensure a more effective transfer of development responsibility.

Other than not conducting this early review, our oversight of VIIRS has been exceptionally rigorous. The acquisition team assigned to VIIRS is staffed with a very experienced and highly qualified Acquisition Manager (the program manager for the subcontract), supported by an equally qualified team of approximately 20 technical, quality, and material and process experts. This team, drawing support from many areas within NGST, Aerospace, NASA and the IPO, conducted over a dozen focused audits, established fourteen working groups to address underlying issues, conducted numerous Surgical Design Reviews to assess design maturity in focused areas, and conducted (or will conduct) over forty Test Readiness Reviews. NGST Mission Assurance personnel resolved issues at SBRS suppliers and in some cases NGST personnel were placed at these suppliers. Over the last four months, extensive detailed design reviews have been conducted in potential risk areas to identify any remaining design issues.

In late 2004, to enhance the acquisition team's effectiveness, NGST placed the Acquisition Manager and 10 of these engineering and manufacturing personnel on-site at SBRS. Northrop Grumman also established frequent executive level communication with Raytheon executives and effectively used award fee to assure proper focus was applied to the VIIRS development. As a result, Raytheon conducted internal au-

dits of SBRS processes and personnel and made significant changes in both. Recently, Raytheon has also improved the reporting structure of the VIIRS development to assure Raytheon executive management is fully responsive to the project needs.

NGST will continue to rigorously manage the development and production of the VIIRS instrument and is continuing to upgrade our subcontract management practices.

Questions submitted by Democratic Members

Q1. You indicated in your written testimony and during the hearing Northrop-Grumman's belief that additional funds in FY 2006 and FY 2007 would result in a lower total program cost and in less schedule delay as compared to other program options being considered. Specifically, what activities would be allocated these additional funds? What risks would be addressed by spending additional funds during the next two years? How much additional funding would you estimate is needed to reduce risks of additional schedule slips and hold down total program costs?

A1. NGST believes that providing additional NPOESS funding would reduce program risk and the risk of further schedule and life cycle cost increases. Increased funding would be used primarily to accelerate resolution of program risks. More specifically, additional funding would help further development on several key sensors. For example, additional funding would be applied to risk reduction activities at Raytheon on the Visible/Infrared Imaging Radiometer Suite (VIIRS), including increased environmental and risk reduction testing of the VIIRS engineering development unit. It would also be used to continue the development of a second source for the VIIRS instrument and also possible procurement of heritage backup sensors for both VIIRS and the Conical Microwave Imager and Sounder (CMIS) along with the necessary modifications to the system to fly those heritage sensors. Funding would be applied to the CMIS development to accelerate risk reduction activities currently underway on CMIS receivers and to selected long lead part procurement to increase CMIS schedule margin.

These activities would lead to more repeatable, lower risk, more cost-efficient production of the flight units and would reduce risk to meeting the launch schedules of NPP and NPOESS. A more assured launch of NPP and NPOESS would minimize the potential gap in weather coverage. The ability to apply new funds to a program to solve problems effectively is both timing and scenario dependent. Since we are well into the fiscal year and NGST is performing in FY 2006 to an efficient NPOESS development plan that supports launch in May of 2012, further funding in FY 2006 would likely not be effective. Depending on the option selected and recertified at the end of the Nunn-McCurdy process, it is highly possible that additional funds in FY07 could help retire more risk earlier and bring the resulting program plan into compliance sooner with a funding profile based on a higher probability of success. It is not possible, however, to quantify that statement until we know which option we are going to pursue.

Q2. You indicated in your testimony that Northrop Grumman was asked to produce options on how to proceed with the NPOESS program "earlier this year" by your "customer." When was the request to produce these options made and specifically, who made the request on behalf of the government?

A2. Northrop Grumman presented three NPOESS program options to the IPO on 31 March 2005. Between April 2005 and September 2005 the IPO requested a broad range of options which traded funding, schedule, and program scope. Over 20 options were developed and presented to the IPO during this period, some being derivatives of previously developed options.

In September 2005 the Independent Program Assessment (IPA) team requested five additional options. These options traded not only funding, schedule, and program scope, but also traded execution risk. Previously developed options had been based on "most probable" outcomes; the IPA requested development of options with high execution confidence. These higher confidence options required lengthening the program schedule and increased funding requirements for the program. The options developed for the IPA led to their recommended Option A, a program that delays NPOESS critical design review (CDR) by 25 months and delays the launch of the first two NPOESS satellites, C1 and C2, by 30 months each.

In October 2005, the IPO requested that NGST develop an Interim Program Plan (IPP) for 2006. NGST developed the IPP around Option A to assure that near-term activities would support the IPA's recommended option. The plan defines only the

2006 program activities, schedule, and expenditure profile in detail, awaiting conclusion of the Nunn-McCurdy process. The tasks which will be completed in 2006 under the IPP represent a significant body of work that is applicable not only to Option A, but also other options under consideration.

Questions submitted by Representative Jim Costa

Q1. It is our understanding that the VIIRS sensor referred to in your testimony is addressing its technical issues and has been meeting the re-baselined VIIRS schedule for almost a year. Is this true, and how does that impact the cost overruns you mentioned?

A1. Beginning in January 2005, we saw notable improvement in the VIIRS sensor subcontractor's performance when working to the Revised Recovery Plan (RRP). Engineering Development Unit (EDU) Integration and Testing (I&T), in particular, made excellent progress and was able to adhere to the RRP schedule for many months. Integration of the Flight Unit 1 (FU1) modules was also progressing well in parallel with the EDU I&T through the end of August 2005 when a structural test failure occurred during testing of the FU1 Aft Optics Assembly. Since there had been numerous structural test failures prior to that time, the decision was made to stop all environmental testing while additional reviews of the designs could be completed. All EDU and FU1 testing was put on hold. An independent team of highly qualified engineers was brought in from other Raytheon divisions and teamed with representatives of Northrop Grumman and the Government to support Santa Barbara Remote Sensing (SBRS). The most critical of these structural, thermal and test design reviews have recently been completed and testing has begun again. In these early stages of resumed testing, performance of the VIIRS subcontractor again appears to be exhibiting the same, if not better, improved performance that we saw during the early portions of 2005.

The infusion of outside personnel has had the benefit of significantly improved rigor in adherence to processes at SBRS In addition, technical analyses are being performed to a greater level of detail and have multiple peer reviews by very senior, highly qualified engineers not associated with the original design. Having completed these detailed analyses and reviews, the chance of additional delays due to test failures has been significantly reduced. Although many of the most critical of these reviews are now complete, additional reviews are ongoing in advance of each test.

To further reduce program risk, testing of the integrated EDU and the Flight Unit was made serial. The schedule impact of this and of the additional design reviews has delayed delivery of the first VIIRS Flight Unit until July 2008. The delay of VIIRS delivery has impacted the remainder of the NPP and NPOESS program schedules, triggering a complete program re-plan. By stretching out the NPP and NPOESS, program launch dates, these ripple effects from the VIIRS program have contributed significantly to the overall cost growth of the NPOESS program.

Q2. According to testimony of Admiral Lautenbacher and Dr. Sega, it appears the work on the VIIRS sensor will move from a concurrent development of the engineering design unit and the flight unit to a serial development. How many people are associated with the flight unit development team? If the team is laid off until the engineering flight unit is developed will there be a problem recruiting the same or new individuals for the flight unit team once the engineering design unit is complete? When do you anticipate the completion of the engineering development unit under this scenario and when do you anticipate reconstituting a flight unit development team?

A2. The VIIRS development plan has been made more serial to assure that design or manufacturing issues uncovered during test of the Engineering Development Unit (EDU) can be incorporated into the Flight Unit. This more serial approach reduces overall program risk and allows the same team that is currently testing the EDU to test the integrated Flight Unit.

Not all of the Engineering Development Unit and Flight Unit tasks will be serial. Currently, the fully integrated EDU is being tested by the Integration and Test (I&T) team while the Flight Unit sub-assemblies are being assembled and tested. Tests of the EDU sub-assemblies were completed in 2005 and findings from these sub-assembly tests have been incorporated in the Flight Unit sub-assemblies. Once the Flight Unit sub-assemblies are completed they will be set aside, awaiting the outcome of the integrated EDU tests in the fourth quarter of 2006. It is anticipated that the Flight Unit team, consisting of approximately 150 personnel, will be reassigned to other programs once Flight Unit sub-assemblies are completed, and that the current EDU Integration and Test (I&T) team will integrate and test the Flight

Unit. A new Flight Unit I&T team will not need to be formed and learning and efficiency will be improved by having the same I&T team test the integrated EDU and the Flight Unit.

Q3. Based on your written testimony, you state: "We have a lot of work to do to improve the technical capability and operability of three of our sensor packages, but we know how to do this and work is under way. We have provided more than 30 different scenarios to our government customers on the critical path forward, optimizing cost and schedule considerations." However, there is no mention of spacecraft issues (e.g., bus design, launch schedules, etc.) and how they will be impacted by the re-baselining of the program. What impacts will you expect resolution of the issues with the sensors and re-baselining of the NPOESS program to have on the portions of the program involving the spacecraft?

A3. Northrop Grumman views development of the spacecraft as low risk, and in 2004 and 2005 delayed its development, so that funding originally intended for spacecraft development could be used to resolve sensor issues. Growth in sensor mass and power during this period has caused growth in the spacecraft mass and power. With this growth, development of the spacecraft remains low risk and well within Northrop Grumman's capability. Northrop Grumman is currently on plan to develop the spacecraft to support a May 2012 launch of the first NPOESS satellite, consistent with IPA Option A.

ANSWERS TO POST-HEARING QUESTIONS

Responses by David A. Powner, Director of Information Technology Management Issues, Government Accountability Office

Questions submitted by Democratic Members

Q1. In response to a question from Rep. Wu about the management structure of the NPOESS program, you indicated the management structure was "typical." This program is acknowledged to be unique in its partnership between three agencies. Was your characterization in reference to the non-governmental management structure—prime contractor as overseer of subcontractors responsible for individual program elements—or did your response refer to the governmental management structure of NPOESS, or both?

A1. My statement that the decision-making structure of the NPOESS program was typical pertained to the relationships among the governmental and non-governmental organizations—including the government's integrated program office, the executive committee, the prime contractor, and the subcontractors. I also noted that it is important that both the government and the prime contractor have oversight into the activities of the subcontractors.

Q2. Does the governmental management structure, which includes an Executive Committee (EXCOM), a Tri-Agency Steering Committee (TSC), and an Integrated Program Office (IPO), represent a more complex structure than is usual for managing satellite system procurement?

A2. The governmental management structure of the NPOESS program is complex in that it involves the partnership of three different agencies (NOAA, NASA, and DOD). Many satellite programs are joint initiatives, involving more than one branch of the military or involving more than one civilian agency. Examples include the Global Positioning System program, the Wideband Gapfiller Satellites, and the Geostationary Operational Environmental Satellite series. The Global Positioning System is an Air Force-led joint program with the Army, Navy, Department of Transportation, National Geo-Spatial Intelligence Agency, United Kingdom, and Australia. The Wideband Gapfiller Satellites program is a joint Air Force and Army program. Prior and current Geostationary Operational Environmental Satellite programs involve integrated NOAA and NASA management. The management structure supporting these projects is often complex—involving interagency responsibilities and agreements.

To handle the competing interests and needs of the three agencies, a tri-agency memorandum of understanding established the IPO to provide joint program management and the EXCOM to provide joint executive leadership—as directed by the Presidential Decision Directive that established the program. TSC was established later, without a charter, as an intermediary group to work with the IPO and report to the EXCOM. A multi-tiered governance structure can be an effective means of overseeing such a complex program, and is not atypical.

Q3. Please briefly compare the performance of this governmental management structure to those of other satellite programs you have observed. How might the performance of the governmental management structure be improved (i.e., are the Independent Program Assessment team's recommendations appropriate)? Are changes in the Program Office management sufficient to correct the management problems with this program or are other changes in program management also needed? If so, what changes would increase the performance of NPOESS program management?

A3. In recent years, we have reported on several satellite programs that have experienced cost, schedule, and performance problems.[1] We found that, while the structure defining how a program is managed is important, it is what these managers do that is key to their performance. Having an effective process for identifying, escalating, and managing risks as well as clear and effective decision-making authority are both critical to effective program management. Regarding NPOESS: in our testimony, we noted that problems involving multiple levels of management—including

[1] For example, GAO, *Space Acquisitions: Stronger Development Practices and Investment Planning Needed to Address Continuing Problems,* GAO–05–891T (Washington, D.C.: July 12, 2005), GAO, *Defense Acquisitions: Incentives and Pressures That Drive Problems Affecting Satellite and Related Acquisitions,* GAO–05–5708 (Washington, D.C.: June 23, 2005), and GAO, *Defense Acquisitions: Assessments of Selected Major Weapons Programs,* GAO–05–301 (Washington, D.C.: Mar. 31, 2005).

the subcontractor, contractor, program office, and executive leadership—have played a role in the NPOESS program's problems. Specifically, technical sensor development issues were attributed in part to the subcontractor's inadequate project management and neither the contractor nor the program office recognized the underlying problems in time to fix them. An independent review of the situation reported that the program office did not have the technical system engineering support it needed to effectively manage the contractor. Additionally, we testified that the involvement of the NPOESS executive leadership has wavered from frequent heavy involvement to occasional meetings with few resulting decisions. Clearly, the performance of the NPOESS governmental management structure would be improved by increasing the technical system engineering capabilities on the program office team, and increasing the depth and frequency of their reviews of contractor and subcontractor performance. Additionally, risks should be analyzed, prioritized and, when appropriate, escalated to senior managers for discussion and decisions. Lastly, the executive board needs to exercise sound decision-making authority in a timely fashion. These changes should help improve the performance of NPOESS program management.

In responding to these questions, we relied on previously reported information on NPOESS and other satellite programs as well as agency documentation describing NPOESS management responsibilities. We performed our work in accordance with generally accepted government auditing standards during January 2006.